LIZARDS AND SNAKES FROM TRANSJORDAN, RECENTLY ACQUIRED BY THE BRITISH MUSEUM (NATURAL HISTORY)

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CONTENTS

SYNOPSIS

A report on 45 lizards and snakes, representing 23 species and subspecies, collected in northern and southwestern Transjordan, mostly during 1963–1965. Taxonomic characters are presented, and compared with data from adjacent areas, mainly Cisjordan. Relevant Transjordanian specimens in the Hebrew University of Jerusalem are also considered, and some identifications are revised. Field observations are cited. *Agama pallida haasi* ssp. nov. is described (type: BM 1965.800; 18 paratypes in BM, HUJ, FMNH). The only additions, on the species level, to the Transjordanian fauna, are *Coluber rhodorhachis* Jan and *Malpolon moilensis* Reuss. The ecological and phytogeographical subdivision of Transjordan into Mediterranean, Irano-Turanian, and Saharo-Sindian territories is reviewed. The distribution of reptiles appears to accord with this subdivision. The difference between the herpetofaunas of Trans- and Cisjordan, on the specific and subspecific levels, is greater in the south than in the north. Notably 7 Irano-Turanian and Saharo-Sindian forms of Transjordan do not occur in Cisjordan. It is suggested that the Wadi 'Arava together with the steep mountains bordering it on the east, may constitute a barrier to the distribution of reptiles.

INTRODUCTION

Transjordan, or Eastern Palestine, is of great zoo-geographical interest. In the north-west it borders on the mesic (Mediterranean) regions of Cisjordan (or Western Palestine), and Syria. To the north and north-east its steppe is continuous with the

steppes of Syria and Iraq, while its south-eastern portions are part of the Arabian desert. In the south-west, along the Wadi 'Arava, Transjordan adjoins the arid south of Cisjordan (Negev of Isreal), which, through Sinai, affords communication with north-eastern Africa.

Despite the efforts of numerous naturalists, zoologists and herpetologists, the herpetofauna of this whole region remains imperfectly known. The best-known territory is the part of Cisjordan which has been within Israel since 1948, although the latest review of its herpetofauna in a European language (Haas, 1951) is now outdated due to subsequent collecting. More recent information is available to readers of Hebrew (Barash and Hoofien, 1956; Wahrman, 1963; Y. L. Werner, 1966). The herpetofauna of Sinai was reviewed by Schmidt and Marx (1956) and Marx (1968), and that of Iraq by Khalaf (1959). The herpetofauna of Syria and Lebanon was the subject of several older reports (referred to by Flower, 1933; Schmidt, 1939; Haas, 1951), and one recent publication (Zinner, 1967).

The least known territory, herpetologically, is Transjordan, where little collecting has been done. Apparently the only recent papers dealing specifically with the herpetofauna of this area are those of Schmidt (1930), Parker (1935), Haas (1943, 1951), Hoofien (1965, 1969) and Werner (1968). A few reports of broader scope also deal with Transjordanian reptiles; notably those of Peracca (1894), Barbour (1914), Schmidt (1939) and Wettstein (1951), and those cited by these authors or by Parker (1935) and Haas (1943, 1951).

Recently the British Museum (Natural History) obtained 39 specimens of lizards, and 6 of snakes, from Transjordan, thanks to the thoughtfulness of three parties whose primary object had not been the collection of preserved reptiles: Mr. S. Bisserôt of the British Jordan Expeditions 1963 and 1965 (Mountfort, 1965), Mr. D. Western of the University of Leicester, and (one specimen) Mr. W. Larmuth. The present material makes a notable addition to our knowledge of the reptiles of Transjordan and their distribution.

In this paper all but one of these new specimens* are described and discussed with a view to stimulating the interest of herpetologists in this little-known region. Comparisons are made with specimens previously collected in Transjordan by Prof. G. Haas, Prof. H. Mendelssohn and Mr. J. H. Hoofien (Haas, 1943, 1951; Hoofien, 1957) and deposited at the Hebrew University of Jerusalem, and with series from Cisjordan in the same collection. The zoogeographical implications of the limited data available are discussed.

LOCALITIES

The localities are indicated by numbers in text-figures 1 and 2, as follows:

1. Jordanian–Syrian border, Jerusalem–Damascus road.
2. Tell el Mukheizin.
3. Ain el Enoquiya.
4. Azraq Druz.
5. Wadi Ratam.
6. El Azraq.
7. Wadi Aseikhim.
8. Azraq Shishan.
9. Jebel Uweinid.

*A specimen of *Stenodactylus grandiceps* Haas, ♂, BM 1963.665, collected by S. Bisserôt at the Azraq Oasis (in a sandy area), was received by the British Museum but not examined by the author.

10. Qasr Amra.
11. Tell Qarma.
12. Qa el Umari.
13. Shaubak.
14. Wadi Musa.
15. Petra.
16. Basta.
17. Rum.
18. Aqaba.

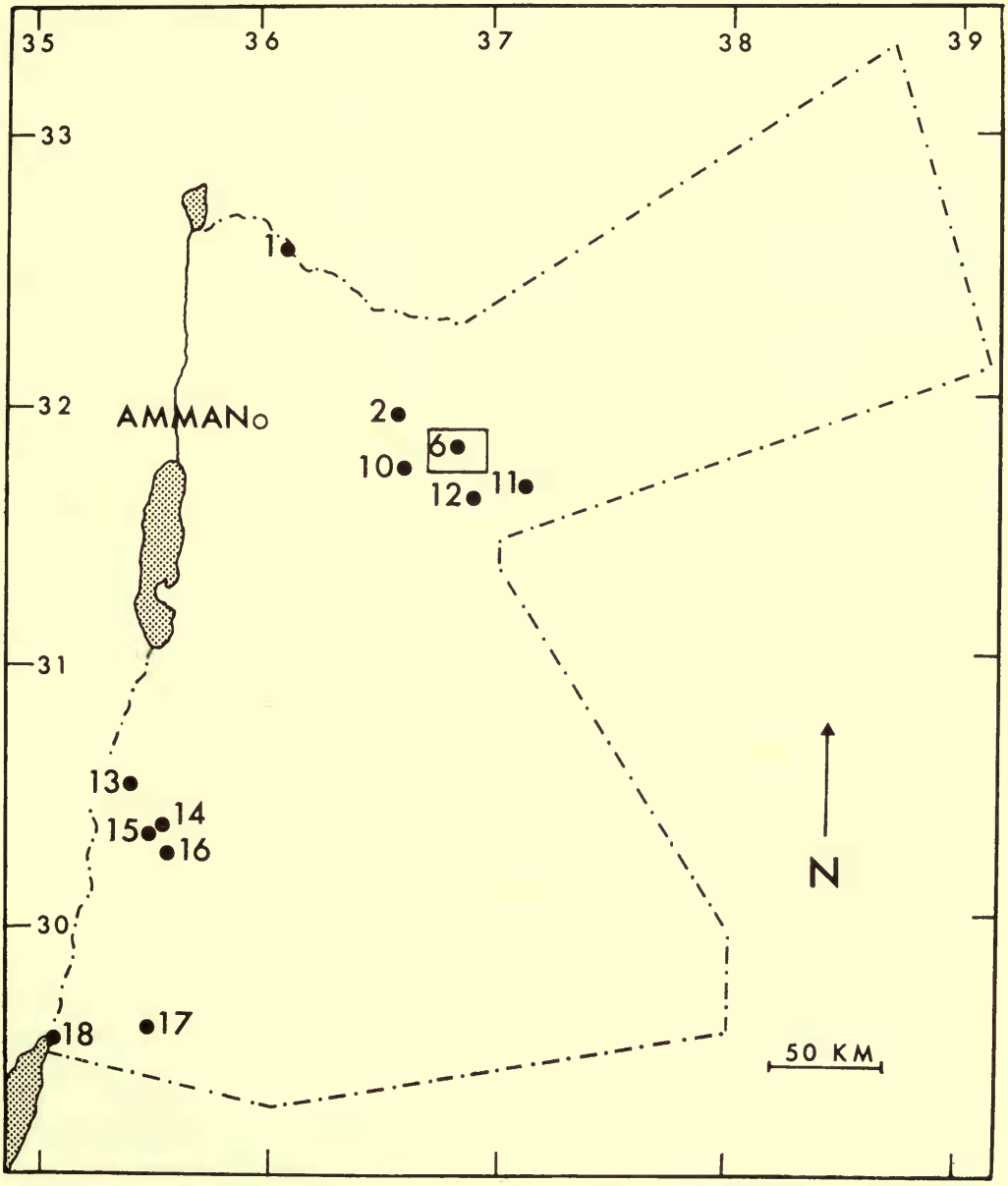


FIG. 1. Localities from which material is reported here. The rectangle around 6 is enlarged in fig. 2. Locality names in text. (Political frontiers as before 1966.)

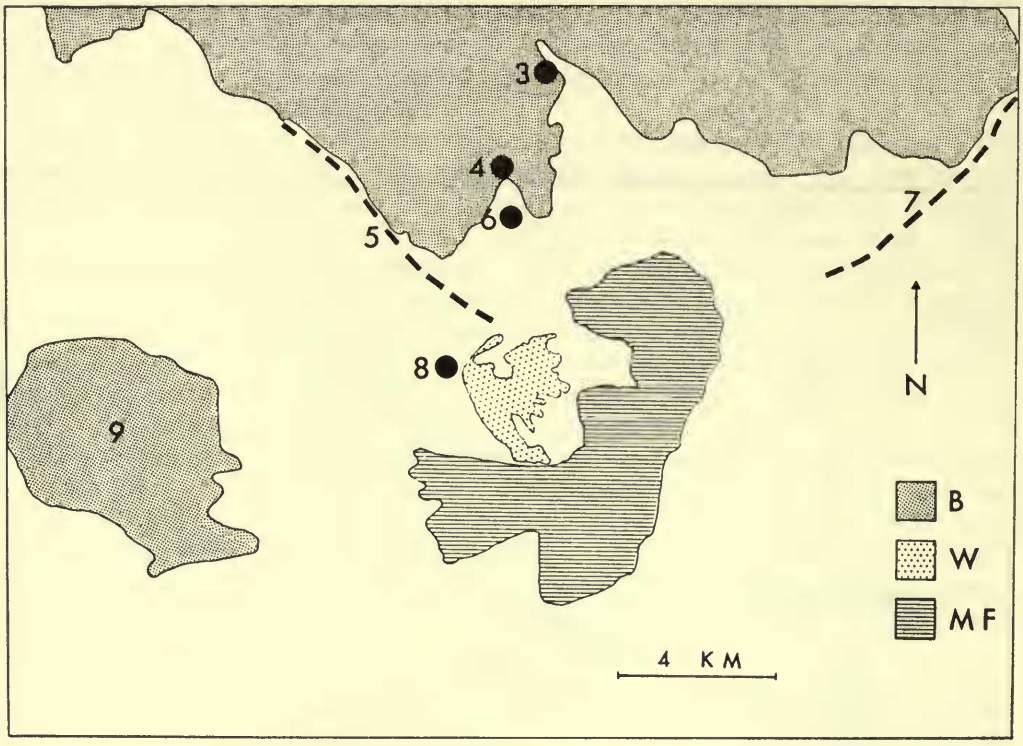


FIG. 2. Localities near Azraq from which material is reported here. This area corresponds to the rectangle around 6 in fig. 1. Locality names in text. B, Basalt areas; W, Water; MF, Mud flats.

METHODS

Abbreviations:

BM—British Museum (Natural History), London.
FMNH—Field Museum of Natural History, Chicago.
HUJ-R—Herpetological Collection, The Hebrew University of Jerusalem.
SMF—Senckenberg Museum, Frankfurt.
SV—Snout-vent length.
%SV—Percentage of snout-vent length.

Measurements: SV length is from the tip of the snout to the anterior margin of the cloaca. Measurements of parts of the body are preferably expressed in %SV (see abbreviations, also Werner, 1969) rather than in absolute values. In *Agama pallida, head length to occiput* is from the tip of the snout to the palpated occipito-atlantal articulation, in a straight line (with dividers); and *head length, total* is from the tip of the snout to the rear of the angle of the jaws, parallel to the long axis of the animal. The *head index* is derived from the formula 100 × "Head length, total"/"Head width".

In the case of *Agama pallida*, the *statistical significance* of differences in numerical

values between sample pairs was tested in the following manner: 1. The significance ($\alpha = 0{\cdot}05$) of the difference between the variances of the two samples was checked, using the *F*-distribution. 2. Regardless of the result, the statistic *t* (Winer, 1962 : 28) was computed, and used in Student's *t*-test (Winer, 1962: 28-29) as follows: 3. First, *t* was assigned $n_a + n_b - 2$ degrees of freedom; all cases in which sample means did not differ significantly, needed no further consideration. 4. Where sample means differed significantly ($\alpha = 0{\cdot}05$), and the variance had not differed significantly, the result was accepted. 5. Where the means differed significantly, but the variances had also differed significantly, the significance of the difference between the means was confirmed by assigning to *t* only the degrees of freedom of the smaller of the two samples, making use of Welch's approximation (Winer, 1962 : 37–38) to the *t'* distribution,

$$t' = \frac{(\bar{X}_a - \bar{X}_b) - (\mu_a - \mu_b).}{\sqrt{(s_a^2/n_a) + (s_b^2/n_b)}}$$

Field notes are credited expressly to the observer (collector) except where the observed animal is cited by its number, whereby the collector's name can be located in 'Material Examined'.

Other terms and procedures are as explained by Haas and Werner (1969), else as defined by H. M. Smith (1946 : 17–30) or as presented by Peters (1964).

LACERTILIA

GEKKONIDAE

Hemidactylus turcicus turcicus Linnaeus

Lacerta turcica Linné, 1758. Syst. Nat., ed. 10, 1, p. 202 (Orient).
Hemidactylus turcius, Boettger, 1876. Ber. offenbach. ver. Naturk., 15/16 : 57.
Hemidactylus turcicus turcicus, Mertens, 1925. Abh. senckenberg. naturf. Ges., Frankfurt a.M., 39 : 60.

Material examined (1). BM 1965.683 ♀, [between Azraq Shishan and Azraq Druze],* April–May 1965, S. Bisserôt.

Pholidosis. Dorsal tubercles keeled, 14 in a diagonal row across the back. Usually 2–3 granules between successive or adjacent tubercles. Counts of scansors are presented in Table 1.

Measurements. SV: 47 mm; tail incomplete.

Coloration. Dorsum with five semi-regular longitudinal rows of brown markings of irregular shape.

Field notes. "The only other gecko found was the Turkish Gecko (*Hemidactylus turcicus*) [one of] which was found in a damaged condition on the track between Azraq Shishan and Azraq Druze" (S. Bisserôt).

Remarks. Five specimens previously collected in Transjordan were available for comparison (HUJ-R 1063 70 km S. of Amman: Sisah-Chissa, 27 March 1936,

*Not indicated on the specimen label, but derived from Mr. Bisserôt's field notes.

Haas; HUJ-R 1064 Hissa-Ma'an, 28 March 1936, Haas; HUJ-R 1068 Wadi Daba'a SSE of Amman, July 1938, Haas; HUJ-R 1587 Jerash, 18 November 1945, Haas and Hoofien; HUJ-R 1588 Birketen-Jerash, 16 November 1945, Haas and Hoofien). Of these, four likewise have 14 rows of tubercles, but one has 12. Scansor counts for these specimens are included in Table 1 and compared to Boulenger's (1885) data for *H. turcicus* and *H. sinaitus*. The specimens from Transjordan, including those from the desert, are typical *H. turcicus*.

TABLE 1

Scansor counts for *Hemidactylus turcicus* from Transjordan, compared to Boulenger's (1885) counts for *H. turcicus* and *H. sinaitus*. (N, number of specimens.)

Locality (and repository of material.)		Scansors (single or paired) under:-			
		Fingers		Toes	
	N	First	Fourth	First	Fourth
Azraq area (BM)	1	7	9	7	12
Jerash area (HUJ)	2	6–7	8	6	9–10
Southern Transjordan (HUJ)	3	7–8	8–9	6–7	10–12
Transjordan, cumulative	6	6–8	8–9	6–7	9–12
Boulenger's *H. turcicus*	28	6–8	8–10	6–8	9–11
Boulenger's *H. sinaitus*	1	5	7	5	8

A pattern of dark (brown) spots arranged in 6–8 longitudinal rows occurs in HUJ-R 1587–8 and, to a lesser extent, HUJ-R 1064. None show a pattern of crossbands or of large X-shaped designs (each stretched across the back), whereas these are often encountered in specimens from Cisjordan, the latter pattern being particularly common in certain localities (*e.g.* En Gedi).

Ptyodactylus hasselquistii cf. *guttatus* von Heyden

Ptyodactylus guttatus von Heyden, 1827, in Rüppell, Atlas Reise nordl. Afrika, 1. Zool.: Reptilien, p. 13, pl. 4, fig. 1 (Tor, Sinai).

Ptyodactylus hasselquistii Phalanx *guttata* (part), Anderson, 1898. Zoology of Egypt, 1. Reptilia and Batrachia, London, pp. 65–67, pl. 6, figs 4, 5 and 5a, pl. 7, figs 6 and 7.

Ptyodactylus hasselquistii guttatus, Barash and Hoofien, 1956. Reptiles of Israel, Tel-Aviv, p. 161.

MATERIAL EXAMINED (4). BM 1963.664 ♀ Rum (rocky area), 1963, S. Bisserôt. BM 1965.782 juv. Petra (on red sandstone), 2 August 1965, D. Western. BM 1965.783 and 1965.784 juvs. Wadi Musa (under yellow sandstone rock), 4 August 1965 (3.30 pm and 12.30 pm resp.), D. Western.

PHOLIDOSIS. Tubercles of the three juveniles flat-conical, with indications of keels; of the adult, distinctly keeled. Hardly any tubercles in front of the ear or on the forearm. Other details in Table 2 ("Petra-Rum") which may be compared with Loveridge's table (1947 : 279).

MEASUREMENTS. Adult: SV: 68 mm; tail missing. Juveniles: SV: 55, 31 and 30 mm resp.; only the last with complete (?) tail: 23 mm.

TABLE 2

Pholidosis and measurements of 12 *Ptyodactylus hasselquistii* sspp. from Transjordan, for comparison with Loveridge's (1947 : 279) table.

Locality (and repository of the material)	Number of Specimens	Internasal Granules	Nasals Surrounding Nostril	Upper Labials	Lower Labials	Tubercle Rows on Dorsum	Scansors under First Toe	Scansors under Fourth Toe	Tubercle Rows on Tail	Greatest Length from Snout to Vent, mm	Greatest Length of Tail, mm
Petra – Rum (BM)	4	1	3–4[1]	11–14	11–13[2]	12–13	3–4	9–11	4–6	68	?
S of Guveira (HUJ)	1	1	3	14	11–12	12	2–3	12	6	62·5	54
Basalt Desert (BM)	1	1	3	12–13	10	10	2	9	6	41	38·5
Jerash area (HUJ)	6	1	3	10–12	8–10	12	2–5[3]	9–11[4]	6–7	67	52

1 Four were observed on only one side of one specimen (BM 1965.784).
2 But 15 were counted on one side of one specimen (BM 1963.644).
3 Each of the extreme counts (2 and 5) occurred on only one side of one animal; in all other cases there were 3–4 scansors under the 1st toe.
4 The count is uncertain on one side of HUJ-R 1653 (? 7–9).

COLORATION. Collector's notes: BM 1965.782, "grey with green and brown spots, light orange mottling". BM 1965.783 and 1965.784, "beige with brown and white spots". After preservation these three juveniles from near Petra are a light greyish brown, with small light spots which are nearly round, and are 3–6 granules across. They are arranged fairly regularly in longitudinal rows; dark brown spots of less regular shape are arranged between them. The adult from Rum (BM 1963.664) is coloured similarly, but the light spots are only faintly discernible, and the dark spots are larger, of more irregular shape, and less regularly scattered. All specimens have whitish underparts.

REMARKS. *Ptyodactylus hasselquistii* is notorious for its high geographical variability (Flower, 1933; Loveridge, 1947; Werner, 1965). This is particularly true in the regions surrounding the Gulf of Suez, Gulf of 'Aqaba, and the Dead Sea, where the typical form meets, mixes, or intergrades with *guttatus*. The present series shows points of resemblance to *guttatus* from (central) Israel, and to the original illustration of von Heyden; but on the basis of our single adult without tail, allocation remains uncertain.

One subadult from S of Guveira (HUJ-R 1027, 28 March 1936, Haas) resembles the present specimens in its keeled dorsal tubercles and in lacking tubercles in front of the ear and on the forearm. Its particulars are included in Table 2.

Ptyodactylus hasselquistii puiseuxi Boutan

Ptyodactylus puiseuxi Boutan, 1893. Rev. Biol. du Nord de la France, 5 (9) : 27–32, pl. 3, fig. 4 ("Bords du lac de Houleh").
Ptyodactylus lobatus syriacus, Peracca 1894. Boll. Mus. Zool. Anat. comp. Torino, 9 (167) : 1–6 (Jerash, Transjordan).
Ptyodactylus hasselquistii puisieuxi, Haas, 1951. Bull. Research Counc. of Israel, 1 (3) : 95.
Ptyodactylus hasselquistii puiseuxi, Barash and Hoofien, 1956. Reptiles of Israel, pp. 160–161.

Material examined (1). BM 1965.682 juv. Basalt desert, Wadi Aseikhim, April–May 1965, S. Bisserôt.

Pholidosis and measurements. Tubercles not keeled, each resembling a low cone. Between ear and corner of mouth 10–15 tubercles, and on each forearm about 15. Other details in Table 2 ("basalt desert") which may be compared with Loveridge's table (1947 : 279).

Coloration. After preservation, dark brownish grey with round whitish dots (2–3 granules in diameter) alternating with roundish dark spots (5–8 granules in diameter). Underparts light grey. Tail with conspicuous alternating dark and light half rings on the dorsal surface; ventral surface is grey with whitish mottling.

Field notes. " . . . the fan-footed gecko (*Ptyodactylus hasselquistii*) . . . greater quantities were found when they eventually were observed for the first time on April 30th 1965, always on the basalt. One clutch of eleven eggs [obviously at least 5½ clutches] of this species was found at Wadi Aseikhim, nine of which were hatched and two not. One captive specimen laid two eggs during the journey back . . . " (S. Bisserôt).

Remarks. The same subspecies occurs at and around Jerash (*terra typica*, Peracca, 1894) as also shown by 6 specimens collected by Haas and Hoofien in 1945 (HUJ-R 1651–5 and 6112). Particulars of these are included in Table 2. The present specimen, closely resembling *puiseuxi* from Jerash and from northernmost Cisjordan, allows us to suggest that *puiseuxi* is probably primarily associated with basalt rocks, regardless of whether these are in a mesic habitat (northern Cisjordan and northwestern Transjordan) or in an arid one (basalt desert of northeastern Transjordan). It is not, however, absolutely restricted to basalt, occurring also on adjacent calcareous formations.

AGAMIDAE

Agama pallida haasi subsp. nov.

(Text-fig. 3; Pls 1, 2)

Agama ruderata pallida (part), Haas, 1943. Copeia 1 : 12.
Agama pallida (part), Haas, 1951. Bull. Res. Counc. Israel 1 (3) : 72–74.

Holotype. BM 1965.800 ♂ Azraq in Transjordan, 12 August 1965, D. Western.

Paratypes (18). Males (10): BM 1965.684 Jebel Uweinid (Basalt desert), April–May 1965, S. Bisserôt; BM 1965.796 Azraq, 12 August 1965, D. Western; HUJ-R 1117 between Sisah and Ma'an, March 1936, G. Haas; HUJ-R 1121 N. Dahaa, 65 m

SSE Amman, June–July 1938, collector unknown; HUJ-R 1134 between Hissa and Amman, 28 March 1936, G. Haas; HUJ-R 5215, 5216 and 5217 between Sisah and Ma'an, March 1936, G. Haas; HUJ-R 1227 near Palmyra, Syria, June 1944, Theodor; FMNH 48468 Wadi Dabaa 65 m SSE Amman, July 1938, collector unknown (from Hebrew University). Females (4): HUJ-R 1118 between Hissa and Ma'an, nr. Ma'an, 28 March 1936, G. Haas; HUJ-R 1120 60 km NE Zerka, Transjordan (no date), Sjoma Graber; HUJ-R 1124 about 12 km S of Amman, 26 March 1963 (?) Mendelssohn; HUJ-R 1884, Wadi Debba, Transjordan, Summer 1939, collector unknown. Juveniles (4): BM 1936.666 Azraq, 16 April 1963, S. Bisserôt; BM 1965.797, 1965.798 and 1965.799 Azraq, 12–13 August 1965, D. Western.

Diagnosis. Ear opening distinctly longer than high, bordered above by a row of conspicuous spines; not round with fairly smooth margin as in *Agama pallida pallida* Reuss 1833 from eastern Egypt, Sinai, and southern Israel. Total size larger, head and body more elongate than in *A. p. pallida*. Ventral scales usually smooth, not keeled as in *Agama agnetae* F. Werner 1939 from western Iraq. (Pls 1 & 2).

Description of holotype. A male. Head very convex, short and thick, but distinctly longer than broad (head index:114). Nostril not tubular, superior, barely above the indistinct canthus rostralis. Nasal shield flat. Upper head scales convex, with short terminal keels; occipital not enlarged. No well-developed spines on the hinder part of the head, but a few occipital scales are pointed (resembling the enlarged scales scattered on the back). A fringe of 3–4 distinct spines on the upper edge of the ear, pointing downwards (in the preserved specimen), except for one spine, on the anterior margin of one ear, which points backwards. Ear opening smaller than eye opening, elongate, nearly twice as long as high; its upper (spiny) border nearly straight and horizontal (Pl. 1 B). No gular pouch. Body depressed, not as short as in *A. pallida pallida* (Pls 1 A; 2 A). Dorsal scales very small, irregular, faintly imbricate, indistinctly keeled; intermixed with scattered larger scales each of which bears a short keel, sometimes ending in a short spine. Scalation of limbs, and proximal quarter of tail, similar to that of back, but the small ground scales larger than on back. Ventral scales smooth, imbricate. Tibia longer than the skull (to occiput). Third finger shorter than fourth, fifth not extending as far as second; third toe much shorter than fourth, fifth not extending as far as first. Tail 145% SV long (somewhat more than twice as long as the distance from gular fold

Measurements of holotype.	mm
Total length	189
Snout-vent	77
Head length (to occiput)	20
Head length (total)	24
Width of head	21
Body (occiput-vent)	57
Forelimb	40
Hindlimb	59
Tail	112

to vent), circular in cross section, its distal three quarters with subequal keeled scales. A double row of 'anal pores' (10 + 12).

Coloration of holotype. Collector's note: "mottled dark grey brown: white dashes". After preservation, brownish grey. Pileus yellowish. In the orbital area, below the eye, six faint grey radiating streaks; side of head otherwise plain. Dorsum with four darker brown crossbands, each interrupted by an irregular whitish vertebral streak. First crossband in front of, second behind, shoulder. Third, indistinct. Fourth just in front of pelvis. Thirteen uninterrupted crossbands on tail. The first two are similar in colour to the ones on the body, the remainder are paler. Underparts light cream, throat mottled with 8–10 grey wavy longitudinal bands.

Variation of the type series. Females have no anal pores, and their heads are shorter (relative to SV length) than in males. The largest specimen is a female (HUJ-R 1118), SV 93·5 mm; largest male (HUJ-R 1117) SV 89 mm. At the upper border of the ear there are 2–4 large and 0–2 small spines; the commonest arrangement is 3 large and 1 small spine. All juveniles, including the smallest (SV: 33 mm), show the distinctive ear features of the new form, except that the enlarged scales bordering the ear opening dorsally are not spiny (Pl. 1 C–D). The ventral scales are moderately keeled on the posterior abdomen of one specimen (HUJ-R 1134). The variations of pholidosis, measurements and proportions, and pattern, and comparable variations of *A. p. pallida* from southern Cisjordan are summarized in Table 3. Differences between the samples from Transjordan and Cisjordan (comparisons being made separately among males, females and juveniles), were statistically significant only in the following instances: Among males, the two samples differed significantly in SV length ($t = 6{\cdot}32$; $t_{10\ (\cdot 05)} = 2{\cdot}23$); in head length (to occiput) in %SV ($t = 2{\cdot}59$; $t_{9\ (\cdot 05)} = 2{\cdot}26$); in head width in %SV ($t = 4{\cdot}53$; $t_{28\ (\cdot 05)} = 2{\cdot}05$); and in the head index ($t = 3{\cdot}52$; $t_{28\ (\cdot 05)} = 2{\cdot}05$). Among females the two samples differed only in head width in %SV ($t = 3{\cdot}18$; $t_{21\ (\cdot 05)} = 2{\cdot}08$) and in the head index ($t = 2{\cdot}13$; $t_{21\ (\cdot 05)} = 2{\cdot}08$).

Collector's note on coloration: "The Pale Agamid (*Agama pallida*) varied considerably, in colour and markings . . .. *A. pallida* showed no colour changes under any circumstances". (S. Bisserôt.)

Field notes. "Three species of . . . Agamidae were seen and collected . . .. *A. pallida* was the most common but was found only on the hamada. . . . On the hamada areas the dominant reptiles appeared to be . . . and Agama pallida . . . " (S. Bisserôt). Two of the adult males (BM 1965.800 and 1965.796) were caught "among small rough stones: flint, basalt and chert on brown silty matrix between stones" (the first at 11.30 h). A juvenile, BM 1965.798 "in shade under Holoxocum silicanum [? *Haloxylon salicornicum*] near black basalt rocks (12.30 pm)"; another juvenile, BM 1965.797, "on flint stone desert", and another among "basalt outcrops—large basalt boulders with white interdispersed silt under rock". HUJ-R 1134 was caught on "Ebene Stein Wüste" (even stone desert).

"The Pale Agamid . . . appeared to rely on three methods of escape, firstly by quick bursts of running when the body was held high off the ground and the head up,

than by flattening the body to the ground and remaining motionless, relying on camouflage, and lastly by an aggressive stance with mouth open always facing the attacker." (S. Bisserôt.)

Growth. The three juveniles collected on 12–13 August 1965 by Mr. Western measure 44, 38·5 and 33 mm respectively (SV). These obviously had hatched earlier in the same season. The one taken on 16 April 1963 by Mr. Bisserôt measures (SV) 46·5 mm and evidently had hatched in the previous summer. The 17 specimens for which the date (at least the month) of collection is known (Text-fig. 3) make it probable that in Transjordan the hatchlings of the year reach ca. 40–50 mm (SV) by autumn, grow to ca. 70–80 mm during the following year, and attain 80–90 mm in their third warm season.

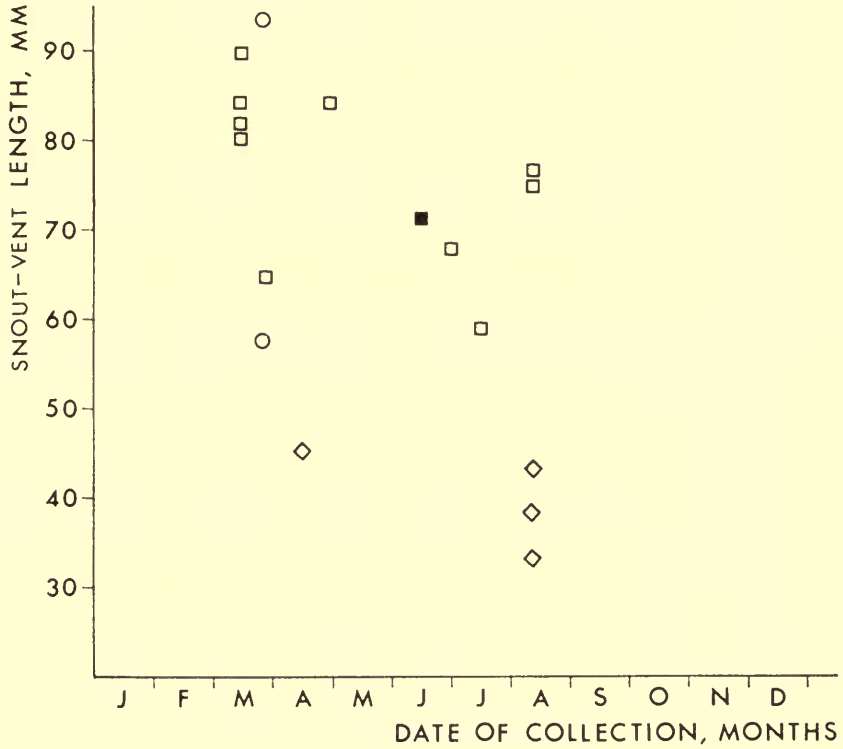


Fig. 3. *Agama pallida haasi* subsp. nov. Sizes of animals caught at different times of the year. Squares, males; Circles, females; Diamonds, juveniles. Open symbols, animals from Transjordan; Solid symbol, animal from near Palmyra, Syria.

Remarks. It is a pleasure to name this lizard in honour of Professor Georg Haas who had already commented on its relatively large size (1951). The new taxon is most closely allied to *Agama pallida* Reuss 1833 from Eastern Egypt, Sinai and Southern Cisjordan. In Reuss' original description there is no indication of the type locality, except that the whole material under discussion had been collected by

TABLE 3

Variation in measurements and proportions, femoral pore counts, and pattern, in *Agama pallida* subspp. from Cisjordan and Transjordan, compared to Reuss' type. (N = number of specimens, OR = observed range, M = mean, SD = standard deviation; SV = snout-vent length, %SV = percents of SV.)

Character		Reuss' type ♀	Cisjordan			Transjordan		
			Males	Females	Juveniles	Males	Females	Juveniles
SV length in mm	N		20	20	20	11	3	5
	OR	81·77	55–67	55–81	29–50	59–89	58·5–93·5	33–50
	M		61·2	67·0	42·5	75·8	77	42·4
Head length, to occiput, % SV	N		20	20	20	10	3	5
	OR	(?)	22·7–27·3	17·1–25·5	21·1–29·5	23·6–30·9	20·9–26·5	25·0–30·3
	M		24·9	23·2	26·4	26·6	23·4	27·4
	SD		1·1	1·7	1·8	2·5	2·9	2·1
Head length, total, % SV	N		20	20	20	10	3	5
	OR	32·0	25·0–32·8	24·7–36·7	26·1–33·0	27·4–31·4	25·7–28·2	31·2–34·0
	M	?	29·5	28·3	29·5	29·7	27·2	32·3
	SD		1·8	2·4	1·7	1·3	1·4	1·3
Head width, % SV	N		20	20	20	10	3	5
	OR	24·7	25·4–29·5	24·1–29·7	26·1–31·0	23·8–28·5	21·9–25·6	26·1–36·0
	M		27·8	27·0	28·6	26·0	23·9	29·3
	SD		1·2	1·5	1·3	1·6	1·9	4·0
Forelimb, % SV	N		20	20	20	11	3	5
	OR	42·7	42·2–54·1	38·8–52·7	41·3–57·9	44·9–61·0	43·9–50·6	49·4–57·6
	M		48·8	46·6	50·9	50·6	48·3	52·3
	SD		3·1	3·2	3·5	4·0	3·9	3·4
Hindlimb, % SV	N		20	20	20	11	3	5
	OR	62·7	68·2–80·3	62·1–80·0	58·7–82·8	65·7–90·0	62·0–76·9	72·7–81·7
	M		72·7	69·2	75·4	74·2	70·0	76·5
	SD		3·1	4·9	5·1	6·3	7·5	3·6

Tail, % SV	N		18	17	19	9	3	5
	OR	86·7	119·3–143·1	93·3–140·0	115·8–144·4	123·1–159·3	103·7–145·3	122·0–132·5
	M		134·2	116·9	129·5	136·3	121·8	127·9
	SD		5·3	11·2	7·7	11·1	21·3	4·4
Head index (100 × head length, total ÷ head width)	N		20	20	20	10	3	5
	OR	129·7	94·1–117·7	93·8–125·7	88·9–115·4	102·7–125·6	110·0–117·1	94·4–121·7
	M	(?)	106·2	105·1	103·2	114·8	114·3	111·3
	SD		5·7	7·0	6·3	7·3	3·0	10·3
100 × hind-limb ÷ forelimb	N		20	20	20	11	3	5
	OR	147·5	137·5–173·1	136·7–164·5	142·1–157·1	138·5–155·0	140·0–152·5	136·8–152·6
	M		149·2	148·7	149·9	146·5	144·7	147·2
	SD		8·0	6·4	4·5	4·2	6·9	6·5
Total number of anal pores	N		19	3[1]	5[2]	11		
	OR	(none)	18–33	11–21	15–20	19–31	(none)	(none or
	M		25·0	17·3	17·2	23·8		uncertain)
	SD		4·0	5·5	2·6	3·3		
Number of rows of anal pores	N		19	3[1]	5[2]	11		
	OR	(none)	2–3	1–2	2	2–3	(none)	(none or
	M		2·2	1·7	2	2·3		uncertain)
	SD		0·4	0·6	0	0·5		
Number of crossbands on tail	N		19	17	16	8	2	5
	OR	9	11–17	7–17	9–17	12–15	12–13	11–14
	M		13·6	12·6	12·6	13·4	12·5	12·5
	SD		1·8	2·3	2·0	0·9	0·7	1·2

1 Sixteen additional females had no anal pores.
2 Fifteen additional juveniles had no anal pores.

Rüppell. Reuss' original specimen label indicates "Aegypt, super." (Klemmer, 1967). The species, however, does not seem to occur in Upper Egypt, and Anderson (1896 : 79) gives "Sinai" as the type locality (see also Flower, 1933). Through the courtesy of Dr. Klemmer I could examine excellent photographs of the type (SMF 10007) and satisfy myself that material from southern Cisjordan and eastern Egypt (Kassassin) is in good general agreement with it. Reuss' description includes no scale counts, but some of his many measurements are represented in Table 3.

The new form is so far known from central and northern Transjordan and SE Syria, but specimens from the rest of Syria and from Iraq will probably also be found to belong to this form. *A. p. pallida* Reuss and *A. p. haasi* n. ssp. are allopatric, possibly separated by the steep slopes constituting the eastern rim of the Wadi 'Arava. Though I have seen no intermediate forms, the few specimens from the Wadi 'Arava being typical *pallida*, conclusive evidence of reproductive isolation is not yet available. Thus it seems best to accord the two forms subspecific rank.

In the northern part of its range *A. p. haasi* may be sympatric with *A. ruderata* Olivier. I have omitted the references for one of these forms having been recorded within the accepted range of the other, as probably some of these instances are based on mis-identifications. However, it is my impression that this is not so in all cases (see also Pasteur and Bons, 1960). It is interesting that it is easier to distinguish between *A. p. haasi* and *A. ruderata*, on the basis of general habitus, than between *A. p. pallida* and *A. ruderata*. Moreover, sexual dimorphism in SV length is apparently moderate in *A. p. haasi* (largest ♂, 89 mm (HUJ-R 1117); largest ♀, 93·5 mm (HUJ-R 1118)), whereas it is considerable in both *A. ruderata* (Pasteur and Bons, 1960) and *A. p. pallida* (among 117 specimens from Cisjordan in the Hebrew University collection, largest ♂, 75 mm (HUJ-R 7509); largest ♀, 87 mm (HUJ-R 5506)). These phenomena apparently represent a case of "sympatric character divergence" (Mayr, 1965 : 82).

It has been argued that *A. pallida* Reuss 1833 is conspecific with, and indistinguishable from, *A. mutabilis* Merrem 1820 (Pasteur and Bons, 1960; Wermuth, 1967). In fact, this possibility had already been mentioned by Anderson (1898). However, the arguments (and diagrams) of Pasteur and Bons do not entirely exclude the possibilities that these are either two distinguishable allopatric forms (Flower, 1933) (with a complex borderline, or intergrading), or even sibling (partly sympatric) species (Schmidt and Marx, 1956 : 25). It therefore seems most prudent to retain, at present, the specific name *pallida* for the populations to which it has traditionally been applied.

Agama blanfordi fieldi Haas and Werner

(Pl. 3 A)

Agama persica fieldi Haas and Werner, 1969. Bull. Mus. Comp. Zool. Harvard, 138 (6) : 337–339, pls. 2–6. (Saudi Arabia: Al-Caissumah – Turaif.)

Material examined (1). BM 1965.686 ♂ Qa el Umari (hard sand desert), 1965, S. Bisserôt.

PHOLIDOSIS. Dorsal scales subequal, keeled and shortly mucronate. Lateral scales similar but smaller. Ventral scales feebly keeled. Scales around middle of body, 80.

MEASUREMENTS. SV, 105 mm; tail, 163 mm.

COLORATION. Collector's note: "*A. persica* when first captured turned to a brilliant blue in the area of the dew-lap under the chin but not on any other part of the body. Both *A. sinaita* and *A. persica* turned blue when killed and preserved in spirit." (S. Bisserôt.) Yellowish grey*. Dorsally, four darker longitudinal bands, brown with still darker margins. Each band is of uneven width, and contains about six alternating dilated and constricted zones. Through the dilated zones run transverse series of white dots which are interrupted by a median light band. Each dot coincides with an enlarged scale, making it more conspicuous. On the head there are two brown wavy crossbands, preceded by a longitudinal patch of the same colour. On the tail the dorsal pattern gradually changes to one of simple dark rings. Belly with a distinct central longitudinal, grey band, and irregular lateral ones. Gular pouch dark grey with remnants of blue.

FIELD NOTES. "Three species of . . . Agamidae were seen and collected . . . on the flat dried sand areas only the one specimen of *A. persica* was found". S. Bisserôt.

REMARKS. This specimen is identifiable according to Boulenger's (1885) key as *A. blanfordi* (S. C. Anderson, 1966a; nom. subs. for *A. persica* Blanford 1881, nom. preoccup.) because of its unequal dorsal scales. However, the gular pouch and the scattered enlarged scales are less developed than in *blanfordi* and the head and body, especially the former, are more depressed than in this form. On the other hand, a series of very similar specimens collected in NE Saudi Arabia by Mr. Henry Field shows considerable variation in the development of the enlarged dorsal tubercles; several specimens have homogenous scaling and are thus identifiable as *isolepis* (Boulenger, 1885, lectotype from between Magas and Bampur, southeastern Iran—S. C. Anderson, 1966b). Similar, apparently, were the two specimens from Mesopotamia which Steindachner (1917) identified as "*isolepis* with a unique pattern". Our specimen is very similar to the pair depicted by him (at least in proportions, pattern, and non-meristic scale characters).

Apparently this is a form allied both to the *agilis-isolepis* Rassenkreis (Wettstein, 1951) and to *blanfordi*. It is, in certain respects, intermediate between the two. It is characterized by variably (mostly feebly) developed dorsal tubercles and gular pouch, and by a very distinctive pattern of longitudinal bands. A confusion concerning *agilis* and *blanfordi* had already been suspected by Schmidt (1941).

This new form has previously been referred to as *A. persica* Blanford. Thus at least part of the series mentioned by Haas (1957) belongs to *A. blanfordi fieldi*, as judged by specimen CAS 84541 (now HUJ-R 7081) and by his description of the pattern of CAS 84477. The latter description has been accepted by Khalaf (1959)

*When examined by the author.

as applying to *A. persica* Blanford though differing from that usually encountered in this species.

Agama sinaita von Heyden

(Pl. 3 B–E)

Agama sinaita von Heyden, 1827. In Rüppell, Atlas Reise nord. Afrika, Rept., p. 10, pl. 3 (Sinai).

Material examined (4). BM 1965.685 ♂ Wadi Ratan [W. Ratam] (basalt desert), April–May 1965, S. Bisserôt. BM 1965.801 ♀, BM 1965.802 ♂ Petra (on red and yellow sandstone respectively), 2 August 1965, D. Western. BM 1965.803 ♀ Wadi Musa, near Petra (basking on soil on top of rock), 4 August 1965, D Western.

Pholidosis. In the specimen from the basalt desert (BM 1965.685) the tail is moderately compressed laterally including its thick basal portion. The two dorsal rows of caudal scales are enlarged, their thick keels creating the impression of a slight crest. The specimens from Petra and Wadi Musa resemble specimens from Cisjordan in that the thick part of the tail is nearly cylindrical, and carries dorsally four straight rows of strongly keeled scales, the two median rows being little better developed than their immediate neighbours (Pl. 3 C & E).

Measurements. SV: 103, 69, 79, 79 mm. Tail of the last: 125 mm (other tails incomplete). In all specimens the third toe is hardly longer than the fourth (Pl. 3 B).

Coloration. "The ability of *A. sinaita* to change colour was observed on several occasions but did not appear to follow a regular pattern. Most specimens were observed to be a brilliant cobalt blue on first sight [Mountfort, 1965: plate 40a] but changed to a dark chocolate brown when pursued. One specimen kept alive changed from brown to blue over the head and shoulders and part of the flanks when food was put in its mouth. This reaction was repeated in captivity in this country [England] and was also caused by the temperature being raised to 80°F [27°C] or higher . . . *A. sinaita* turned blue when killed and preserved in spirit." (S. Bisserôt.)

Professor H. Mendelssohn (Tel-Aviv University) has studied the colour changes of this species, as part of his research of its behaviour, and found marked sexual dichromatism. Hence the arrangement of the following notes on our specimens.

Males: BM 1965.865 (preserved): blueish grey (throat and belly darker), tail grey (yellowish ventrally). 1965.802, collector's note: "bright blue all over, faded after death." The preserved specimen is dark grey, nearly black, with underparts lighter (and posteriorly very light) brownish grey.

Females: Collector's notes summarized: "head blue when alive, turning brighter blue when killed. Body grey with orange blotches". After preservation the heads are blackish, the bodies dark grey, and the tails have alternating darker and lighter transverse bands. The throats are grey (reticulated in 1965.801) and the abdomens steel grey; the remaining underparts are cream-white.

Remarks. The unusually large male with compressed tail, from the basalt desert, conceivably represents a distinct subspecies, but this cannot be assessed on the basis of a single specimen. (Wettstein, 1951 : 433, mentions three specimens

from northern Transjordan, but gives no particulars apart from the colour.) The remaining specimens have tails similar to those of animals from southeastern Israel and northeastern Sinai, and the same is true of two collected by Haas between Guweira and Aqaba in 1936 (HUJ-R 1137, HUJ-R 5231). On the other hand, all the specimens from Transjordan are characterized by the third toe being hardly longer than the fourth. Specimens from southeastern Israel and northeastern Sinai usually have a longer 3rd toe (Pl. 3 B & D).

Agama stellio brachydactyla Haas

(Text-figs 4, 5)

Agama stellio brachydactyla Haas, 1951. Ann. Mag. Nat. Hist. (Ser. 12), 4 : 1052 (Israel : foot of Jebel Lussan, near Israel-Sinai frontier, S.S.W. of Beer-Sheba).

Material examined (3). BM 1965.787–789, Basta (remarks on habitats, under coloration), 3 August 1965, D. Western.

Pholidosis. A mid-dorsal band of unequal enlarged scales, about six times as broad as one of the larger scales. The transverse series of tubercles extend across this band. They are slightly interrupted medially but here some of the interstitial scales are almost as large as the tubercles themselves. All large scales are either distinctly keeled, mucronate, or spinous (Text-fig. 4).

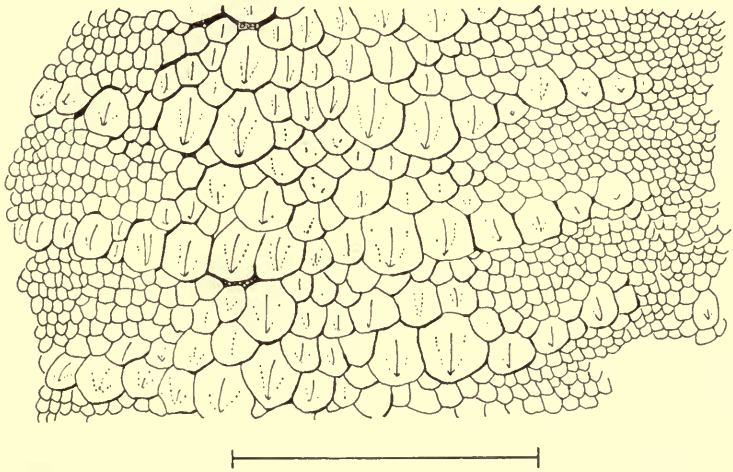


Fig. 4. *Agama stellio brachydactyla.* Mid-dorsal sclaes of BM 1965.787 from southern Transjordan (Basta). (From a photograph.) Scale, 10 mm.

Lamellae under 1st finger: 9, 10, 9. Under 4th toe: 22, 24, 22.

Measurements. SV: 110, 84, 103 mm. Tail of smallest: 116 mm; other tails incomplete. Foot hardly longer than tibia, being shortest in largest specimen.

Coloration. Collectors notes: 1965.787, "Back: black; black and yellow transversely striped tail; orange blotches near head (basking on orange mauve quarzite,

3.25 pm)." 1965.788, "Yellow and black with orange spots on neck. (On yellow sandstone, 4.20 pm)". 1965.789, "Brownish with orange and brown blotches. Tail black with orange transverse stripes. (On soil besides flintstone, 3 pm)".

In the preserved condition all three specimens are grey dorsally with pale yellowish blotches, the largest blotches arranged in mid-dorsal asymmetrical pairs, each pair tending to fuse and to form a large obliquely transverse blotch. On the tail, transverse bands of the same yellowish colour, which also covers the underparts, the throat being faintly reticulated with pale grey.

Remarks. All three specimens are presumably not fully grown. These individuals are not very typical *brachydactyla*. In the number of lamellae under the toes, as well as in the relative size of the mid-dorsal scales, they rather resemble specimens from the northern Negev in Israel, which are intermediate between *brachydactyla* and the form inhabiting mediterranean Israel. The specimens from Basta are assigned here to *brachydactyla* in accordance with their coloration and also in order to indicate their geographical affinities (Daan, 1967).

Six other specimens from Transjordan are available. Only one from Petra (HUJ-R 1096, 29 March 1935, Haas) shows a similar arrangement of a mid-dorsal band of subequal enlarged scales. Two other specimens from southern Transjordan (HUJ-R 1094 and 1103) and three from the Jerash-Amman area (HUJ-R 1101, 1110A, and 1110 B) have the dorsal transverse series of tubercles clearly separated by smaller scales, as is usual in specimens from northern Cisjordan.

The number of lamellae under the 4th toe in the nine specimens from the two areas in Transjordan is presented in Text-fig. 5 which also includes, for comparison, samples from five localities in Cisjordan. As the figure shows, in Cisjordan there is a pronounced north-south gradient in this character (with the higher values in the north). A parallel but less prominent gradient is indicated in Transjordan.

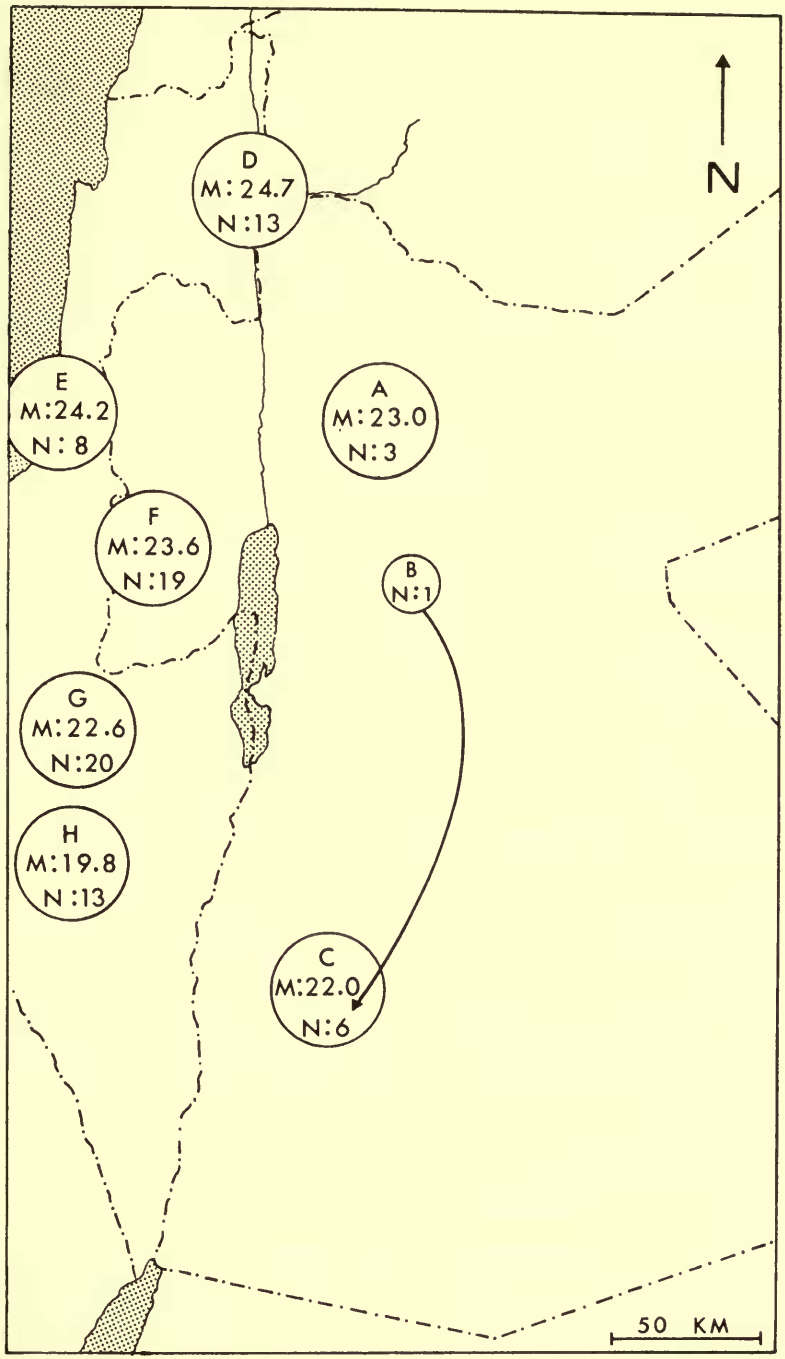
CHAMAELEONIDAE

Chamaeleo chamaeleon recticrista Boettger

Lacerta chamaeleon Linnaeus, 1758. Syst. Nat., p. 204 (Africa and Asia.)
Chamaelo vulgaris var. *recticrista* Boettger, 1880. Jahresber. senckenberg. naturf. Ges. Frankfurt, p. 198 (Jeruslaem and Haifa).

Material examined (1). BM 1963.667 juv. between Shaubak and Tafila (on camel thorn), 1963, S. Bisserôt.

Fig 5. *Agama stellio* subspp. Numbers of lamellae under fourth toe in Trans- and Cisjordan. Material included in each sample was collected within the area of the map covered by the relevant circle. (A) Jerash–Amman area; (B) Desert locality included in sample C; (C) Petra–Basta area; (D) Hills surrounding Lake Tiberias; (E) Ramot-HaShavim; (F) Jerusalem and adjacent Judaean Hills; (G) Be'er-Sheva and vicinity; (H) Sde-Boker–'Avdat area; M, Mean; N, Number of specimens. (Political frontiers as before 1966.)


N
D
M: 24.7
N: 13
E
M: 24.2
N: 8
A
M: 23.0
N: 3
F
M: 23.6
N: 19
B
N: 1
G
M: 22.6
N: 20
H
M: 19.8
N: 13
C
M: 22.0
N: 6
50 KM

Pholidosis. Gular and abdominal crest of enlarged scales present.

Measurements. SV: 44 mm; tail: 42 mm.

Coloration. Grey with irregular dots of darker grey. On each flank two longitudinal rows of five light cream blotches. Enlarged scales of dorsal, gular and abdominal crests the same light cream.

Remarks. A half-grown specimen from El-Hamma (NW Transjordan, in Israel HUJ-R 1501; 13 March 1945, Coll. G. Haas) is similarly coloured. In a juvenile from Jerash (HUJ-R 1502; 15 November 1945, Coll. Haas and Hoofien), measuring 36 mm (SV) the occipital casque is not (yet) developed. All three specimens conform to the chamaeleons of northern Israel rather than to the *C. c. musae*-like animals from further south (Hoofien, 1964).

LACERTIDAE

Acanthodactylus boskianus asper Audouin

Lacerta aspera Audouin, 1829. Descr. Egypte, Rept., Suppl., p. 173, pl. 1 fig. 9 (Egypt).
Acanthodactylus boskianus var. *asper* Lataste, 1885. Ann. Mus. Genova 2 (2) : 496.

Material examined (3). BM 1965.691 ♂ and BM 1965.693 ♀ Tell Quarma [=Tell Qarma] (blown sand wadi), April–May 1965, S. Bisserôt. BM 1965.804 ♀ Wadi Musa near Petra (sandy soil near bushes), 4 August 1965, D. Western.

Pholidosis. Scales across middle of body: 31, 38, but 55 in BM 1965.693. Gular scales in straight median series: 26, 32, 26. Lamellae under 4th toe: 21–22.

Measurements. BM 1965.691, 56 mm SV, 121 mm tail. BM 1965.693, 81 mm SV, and BM 1965.804, 62 mm SV (tails incomplete).

Coloration. BM 1965.804, collectors note: "brown: long orange stripes, spotted with black".

Remarks. Eleven other specimens from various localities in southern Transjordan (HUJ-R 1335, 1338, 1341, 1661, 5041–6, 5053) have the following pholidotic counts: Scales across middle of back, 29–51 (against 29–42 in southern Cisjordan, N = 24). Gular scales in a straight median line, 25–35 (24–31, in Cisjordan, N = 24). Lamellae under 4th toe, 19–22 (as in Cisjordan). Other conventional counts are also similar in Cis- and Transjordan except that some Cisjordan specimens show a reduction of the lateralmost ventral plates, so that only 8–9 longitudinal series are present.

In general, adult male *A. b. asper* are larger than females. The 2 largest males seen from Transjordan are 75 and 77 mm (SV), so that the female from Tel-Qarma (81 mm) appears unusually large.

The dorsal pattern of some Transjordan males includes rows of sharply defined blackish dots, instead of the more usual rows of irregular brownish spots.

Acanthodactylus grandis Boulenger

(Pl. 4 A, B)

Acanthodactylus grandis Boulenger, 1909. Ann. Mag. Nat. Hist., 4 (8) : 189 (Jerud and Ataiba, Syria).

Material examined (2). BM 1965.692 ♀ Ain el-Enoquiyya (sand and stone wadi); BM 1965.694 ♀ Tell el Mukheizin (Hamada, beneath carcass of dog); both April–May 1965, S. Bisserôt.

Pholidosis. Scales across middle of body: 60; 60. In BM 1965.692 there is a fifth small upper labial before the center of the eye, on each side.

Measurements. BM 1965.692: SV: 73 mm; tail: 126 mm. BM 1965.694: SV: 96 mm (tail incomplete).

Coloration. BM 1965.692 (Pl. 4 B): Black spots, each covering up to ten scales, arranged in ten regular longitudinal rows, and in irregular transverse series. The two median rows begin at the occiput but disappear before the middle of the back; 4th and 5th row on each side present on flanks but absent from neck. Some rows extend on the tail, on the lateral sides of which the spots are represented as vertical blotches at every second suture between scale rings. Ground colour (preserved), nearly uniform grey (compare Pl. VI of Boulenger, 1923).

BM 1965.694 (Pl. 4 A): Six dark longitudinal stripes faintly indicated on back. Along these there are a few, irregularly scattered, small blackish spots, each covering up to 7 scales.

In both specimens the sides of the head bear alternate light and dark vertical bars, one of the latter passes through the eye.

Remarks. All characters of both specimens are within the range of variation shown by *A. grandis* in the HUJ collection, some of which have been mentioned by Haas (1943; Transjordan between Hissa and Ma'an). There is some difficulty in distinguishing immature *A. grandis* from *A. scutellatus scutellatus*, which likewise has smooth scales, since the range of variation of almost all conventional scale counts is nearly identical (see also Boulenger, 1923 : 50). BM 1965.692 resembles *A. s. scutellatus* in the number of supralabials (5) before the center of the eye, and in its relatively long foot with moderately well developed pectination. The specimen however is certainly assignable to *A. grandis* for the following reasons:

The snout with its somewhat swollen nasals resembles that of other *A. grandis*, and not at all the pointed snout of *A. s. scutellatus*.

While five supralabials in front of the center of the eye are characteristic of *A. s. scutellatus*, and 4—of *A. grandis*, 5 may sometimes occur in the latter (see also Boulenger, 1921 : 114–115).

The longer foot and relatively stronger pectination (when compared to large *A. grandis* such as BM 1965.694) appear to be largely juvenile characters, which are paralleled in series of other species of *Acanthodactylus* containing mature and immature specimens. Moreover the pectination is still far less developed than in adult *A. s. scutellatus* from southern Israel.

The pattern conforms closely to that of *A. grandis* and differs most strikingly from that of *A. s. scutellatus*, as the latter never show any longitudinal arrangement of the markings.

Acanthodactylus tristrami tristrami Günther

(Pl. 4 C, D)

Zootoca tristrami Günther, 1864. Proc. Zool. Soc., p. 491 (Lebanon).
Acanthodactylus tristrami Boulenger, 1881. Proc. Zool. Soc., p. 746, pl. 64, fig. 1.

Material examined (1). BM 1962.352 ♀ Jordanian–Syrian border, Jerusalem–Damascus Rd (Outside customs shed) [probably loc. 1 on map], 4 June 1952, W. Larmuth.

Pholidosis. Scales across middle of body: 59. Longitudinal rows of ventrals: 11. Other characters also in agreement with Boulenger's (1921) data for *A. tristrami*.

Measurements. SV: 82 mm; tail (tip missing): 86 mm.

Coloration. The blackish markings tend to form a reticulum along each side of the dorsum (Pl. 4 C).

Field notes. "Died while ovipositing".

Remarks. Angel (1936) described from NE Syria *A. t. orientalis* (48–56 scales across middle of body), which was also reported from the neighbourhoods of Rutba (Schmidt, 1939) and Mosul (Haas, 1952) in Iraq. From Haditha, Iraq, Schmidt (1939) described *A. t. iracensis* (45–46 scales across middle of body). Thus Günther's (1864) and Boulenger's (1921) *A. tristrami* was accorded subspecific rank as *A. t. tristrami* (58–65 scales across middle of body).

Our specimen appears assignable to the typical form, as well as two specimens in the HUJ collection, reported by Haas (1943): HUJ-R 1333 ♂, 15 km S of Amman, SV 92 mm; HUJ-R 1332 ♀, 45 km S of Amman, SV 69 mm (after a year in captivity). Scales across middle of body, 58, 57 respectively. Ventrals in 10 rows.

All three specimens are larger than Angel's *A. t. orientalis* (1936; 50–66 mm snout-vent, N = 8), although this alone would not have been taxonomically significant.

The dorsal pattern of HUJ-R 1333 (♂) consists of distinctly X-shaped blackish marks (Pl. 4 D; Boulenger, 1921). Markings intermediate between this pattern and the reticulum of BM 1962.352 (♀) are present on the female (the type ?) figured by Tristram (1885: Pl. 16, fig. 2).

Eremias brevirostris microlepis Angel

Eremias brevirostris microlepis Angel, 1936. Bull. Inst. Egypte 38 : 112–113 ("Haouarine" 55 km SE of Homs, Syria).

Material examined (2). BM 1965.689 ♀ (?) Qasr Amra (hamada); BM 1965.690 ♀ (?) Shishan (hamada); both, April–May 1965, S. Bisserôt.

PHOLIDOSIS. Scales across middle of body: 60; 62. Longitudinal series of ventral plates: 10. Plates in collar: 9. Gular scales in a straight median series: 29; 28. Femoral pores: 15, 14–15. Lamellae under 4th toe: 20; 24. Upper labials anterior to centre of eye: 5, the 5th being the first of two small false supralabials below the subocular.

MEASUREMENTS. SV 46; 49 mm. Tail: 69 (tip missing); 81 mm.

COLORATION. Both pale, the ocelli inconspicuous.

FIELD NOTES. "The blown sand areas in wadis were the chief habitat of the fringe-toed lizards, *Acanthodactylus* . . . however the lizard (*Eremias brevirostris*) was also seen in this habitat but not as frequently as on the hamada" (S. Bisserôt).

REMARKS. Specimens from eastern and north-eastern Syria, like those from Iraq, are so far inseparable from the typical form (Angel, 1936; Schmidt, 1939; Haas and Werner, 1969). Angel's *microlepis* from western Syria (and a greater altitude) had been based on a single specimen, and was not regarded as valid by Haas (1957 : 73). However, the present two specimens from northern Transjordan agree fairly well with Angel's description. Furthermore, 13 specimens from central Transjordan (Amman–Ma'an) in the collection of the Hebrew University (Haas, 1943 : 14) show a clear affinity to *microlepis*, having 46–57 (commonest numbers 53–54) scales across the middle of the body, and also relatively small gular scales (21–29, usually 25–27, in a straight series). Interestingly a specimen from southern Transjordan (Guweira–Aqaba, HUJ-R 1230) has only 44 scales across the middle of the body (and 25 gulars). For comparison, Angel's (1936 : 112) *E. b. brevirostris* from NE Syria had 40–52 (commonest numbers 47–49) scales across the middle of the body, and 20–25, usually 21–23, gular scales in a straight series. Thus *E. b. microlepis* occupies the centre (around Jebel ed Druze) of the western distributional frontier of the species (Hoofien, 1957), possibly intergrading with the typical form to the north, east and south.

Eremias guttulata guttulata Lichtenstein

Lacerta guttulata Lichtenstein, 1823. Verz. Doubl. Mus. Berl., p. 101 (Egypt).
Eremias guttulata, A. Smith, 1845. Ill. Zool.. S. Afr., Rept., Pl. 48, fig. 8.
Eremias guttulata forma typica, Boulenger, 1921. Monograph of the Lacertidae, London, 2, p. 258.
Eremias guttulata guttulata, Wettstein, 1928. Sitzber. Akad. Wiss. Wien (math.-natur.) 137, Abt. 1, p. 782.

MATERIAL EXAMINED (1). BM 1965.688 ♂ 2 miles S of Azraq Druze (basalt desert), April–May 1965, S. Bisserôt.

PHOLIDOSIS. Scales across middle of body: 50. Longitudinal series of ventral plates: 8. Femoral pores: 13–14. Lamellae under 4th toe: 22–24. Upper labials preceding subocular (which enters lip): 4.

MEASUREMENTS. SV: 46 mm. Tail: 83 mm (tip regenerated).

Coloration. The dark borders of the dorsal 'ocelli' are black and tend to merge with their neighbours laterally, forming incomplete black crossbands, which are interrupted by the white centres of the 'ocelli'.

Remarks. The snout is very elongated, pointed and flattened. In comparison with specimens from Cisjordan the pileus is smooth and flat, eyes and nostrils being little elevated.

Fourteen other specimens from various localities between Amman and Petra (HUJ-R 1237, 1240, 1256–7, 1259–60, 1262–3, 6236–8, 6273–4, 6300) have the following ranges of counts: Scales across middle of body, 44–57 (48–52 in 9 specimens). Longitudinal series of ventral plates, 10. Femoral pores, 10–14 (12–13 in 9 specimens). Lamellae under 4th toe, 18–24 (22 in 6 specimens). Upper labials preceding subocular, 4. The pileus, as in the Basalt Desert specimen, is relatively smooth and flat, although in a few specimens the nostrils (and sometimes the eyes too) are somewhat elevated.

The 3 largest specimens measure 50–51 mm (SV).

In none of these 14 specimens does the dark component of the pattern occupy such a large area as in the specimen from the Basalt Desert, nor is this component black. In some specimens it is brown, in others, pale to the point of becoming indistinct. Some specimens show a tendency for lateral confluence of 'ocelli', but the resulting pattern resembles strings of beads rather than crossbands of uniform width. The range of coloration known from Cisjordan resembles that shown by these 14 specimens. Thus the Basalt Desert specimen is outstanding in its black and extensive dark pattern, perhaps as an adaptation to its habitat.

Ophisops elegans blanfordi Schmidt

(Text-figs 6, 7)

Ophisops blanfordi Schmidt, 1939. Zool. Ser. Field Mus. Nat. Hist., 24 (7) : 64–65 (Halfaya, 20 miles east of Amara, Iraq).

Material examined (2). BM 1963.668 ♂ N of Shaubak, 1963, S. Bisserôt; BM 1965.687 ♀ Ain el Enoquiya (sand and stone wadi), April–May 1965, S. Bisserôt.

Pholidosis. Scales and plates around middle of body 38; 34. Femoral pores: 10–11; 10–11. Lamellae under 4th toe: 22–24. Upper labials preceding subocular: 4. Third postsubocular in broad contact with auricular. Postnasal: single. Occipital of medium size (somewhat larger than postnasal).

Measurements. SV: 42; 40 mm. Tail of ♂: 92 mm; of ♀ missing.

Coloration. Both have the usual *Ophisops elegans* pattern except that there is a distinct dark vertebral line running from the occiput to the pelvic region.

Remarks. Both specimens agree with Schmidt's description, except in having a slightly higher number of scales around the body (Schmidt's 92 specimens, all from the lower Tigris-Euphrates Valley, had 30–36 scales and plates around the middle of the body, averaging 33).

The dark vertebral line observed in the two specimens from Transjordan occurs only rarely in *O. e. ehrenbergi* from Cisjordan (N = 50), and then only on the neck. Likewise, Lantz (1930 : 41) says of the pattern of *O. e. elegans* "Dessin caractérisé per la bande occipitale rudimentaire . . . Bande occipitale absente ou reduite à un petit trait ou à quelques petites taches noires sur la nuque." It is much commoner, and better developed, in *O. e. schlueteri* from Cyprus (N = 16).

Ophisops from Transjordan in the HUJ collection fall into two groups. All those from Jerash and its vicinity (N = 16: HUJ-R 1190, 1203, 1204/1–2, 1205, 1206/1–4, 1207/1–3, 1208/1–2, 1209, 1561) have double postnasals. In most of them, the vertebral line is either absent, or confined to the occipital region; but in 3 ♂♂ it extends to the shoulders and in a single male it reaches the midbody although it is very faint. These specimens appear to be assignable, like all those from Cisjordan, to *O. e. ehrenbergi*. On the other hand, specimens from between Amman and Petra are assignable to *blanfordi* (N = 9: HUJ-R 1183, 1186, 1218, 1220–22, 6158–60). Of these, 5 have single postnasals, 3 have double postnasals, and one is

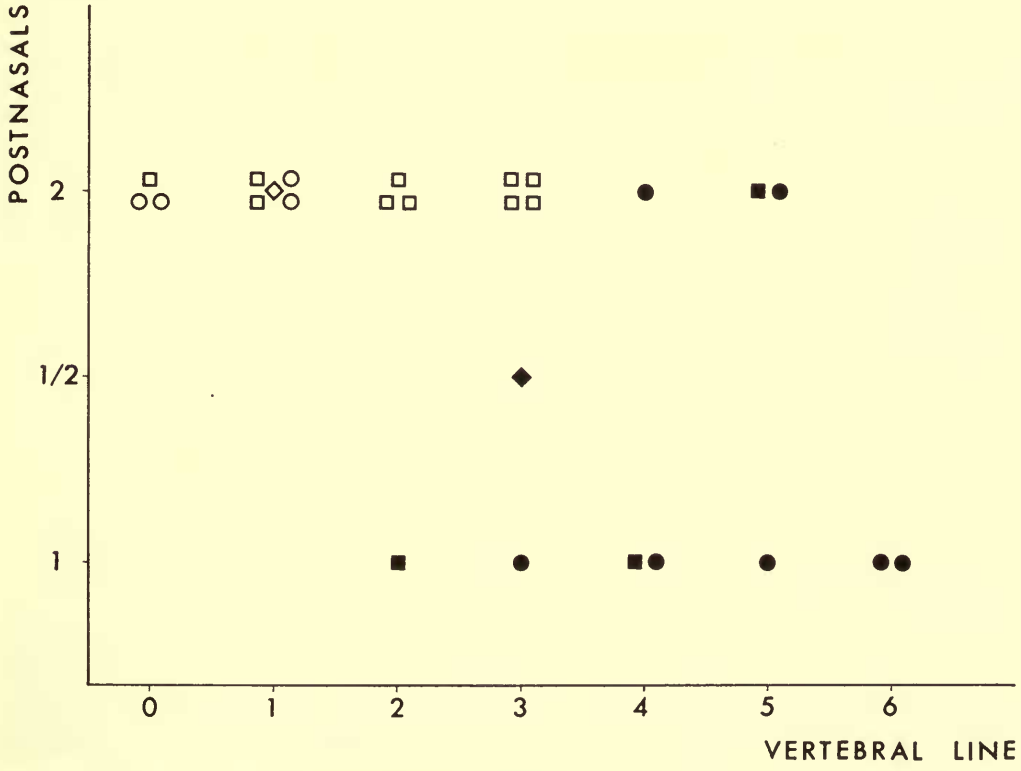


FIG. 6. *Ophisops elegans* subspp. from Transjordan. Number of postnasals against extent of vertebral line (0, none; 2, only on occiput; 3, reaching shoulder; 4, reaching midbody; 5, reaching pelvis; 6, reaching tail base. These values are adjusted by + 1 for unusually intense lines, and by –1 for particularly faint ones). Open symbols, *O.e. ehrenbergi* from the Jerash area; Solid symbols, *O. e. blanfordi* (details in text); Squares, males; Circles, females; Diamonds, juveniles.

asymmetrical. In most the vertebral line is well developed and this is particularly true of those with double postnasals. Thus the two forms are distinguishable by the combination of these two characters (Text-fig. 6). Possibly they are also distinguishable by a combination of femoral pore number and vertebral line extent (Text-fig. 7).

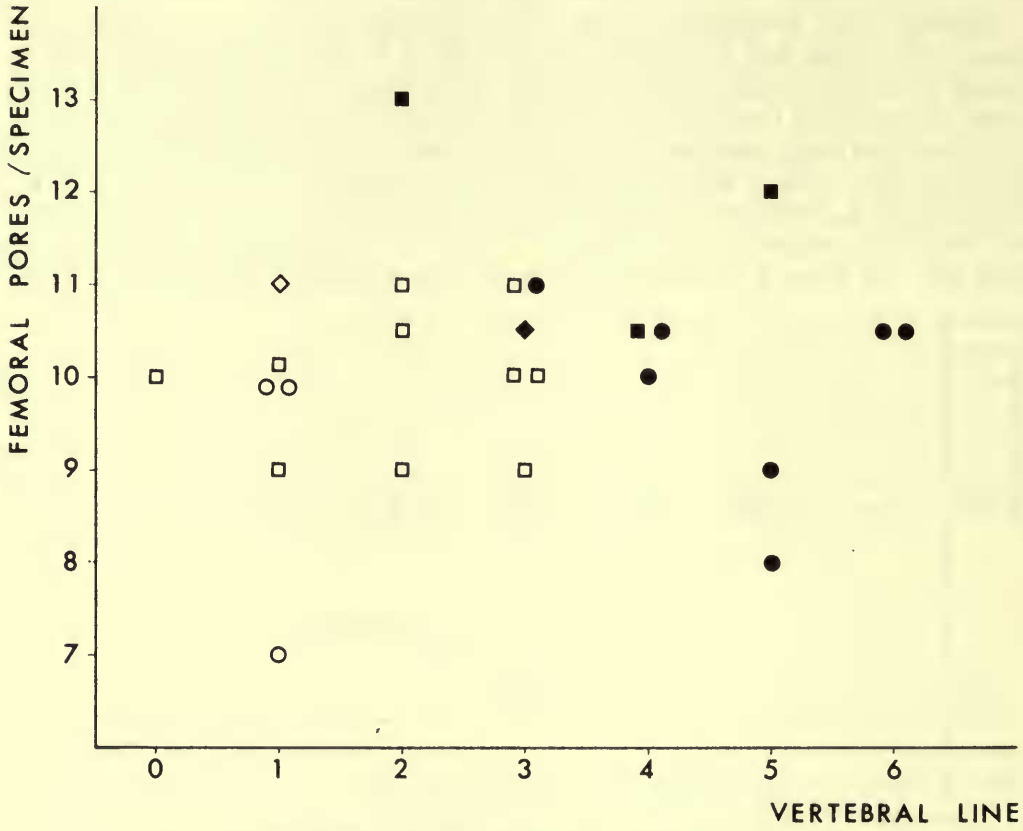


FIG. 7. *Ophisops elegans* subspp. from Transjordan. Number of femoral pores (represented for each specimen as the mean of both femurs) against extent of vertebral line. Symbols as in fig. 6.

The 9 HUJ *blanfordi* specimens have the following scale counts: Scales and plates around middle of body, 29–44 (39–41 in 4 specimens); Femoral pores, 8–13; Lamellae under 4th toe, 20–25. Neither these nor the remaining conventional counts differ markedly from those found in *O. e. ehrenbergi*.

In conclusion, while the *Ophisops* of the Jerash district appears to be consubspecific with *O. e. ehrenbergi* of Cisjordan, the form occurring in the more arid parts of Transjordan is Schmidt's *O. blanfordi*. This, however, does not seem to merit specific rank since there are indications of intergradation with *O. elegans* in Transjordan (details above) and Iraq (Haas and Werner, 1969), and there is no evidence of

sympatry. Two additional alleged *blanfordi* characters in fact occur also in (other) *O. elegans*: the small temporal scales, which occur in *O. e. schlueteri* (Cyprus); and the situation of the third post subocular which in *O. e. ehrenbergi* (Cisjordan) and *O. e. schlueteri* sometimes touches and sometimes fails to touch the auricular.

SCINCIDAE

Chalcides ocellatus ocellatus Forskål

Lacerta ocellata Forskål, 1775. Descr. Anim., p. 13 (Egypt).
Chalcides ocellatus forma typica, Boulenger, 1890. Ann. Mag. Nat. Hist. 5 : 444–445.
Chalcides ocellatus ocellatus Wettstein, 1928. Sitzber. Akad. Wiss. Wien (math.-natur.), 137, Abt. I, p. 784.

MATERIAL EXAMINED (1). BM 1965.785 Aqaba (on rocks close to beach, Red Sea coast), 5 August 1965, D. Western.

PHOLIDOSIS. Scales around the middle of the body: 30.

MEASUREMENTS. SV 61 mm; tail: 69 mm.

COLORATION. Collector's note: "brown with darker brown and white spots". The 'ocelli' are numerous and are arranged in transverse series on the neck and tail. They are small, each occupying less than a single scale.

REMARKS. Two out of 3 specimens (the 3rd being damaged) from 65 miles SSE of Amman (HUJ-R 1442, 5107, 5108—June–July, 1938 Haas) have 28 scale rows. The same applies to HUJ-R 1469 from El-Hamma (NW Transjordan within Israel—13 March 1945, Haas). The pattern of HUJ-R 5107 is remarkably irregular, many of the 'ocelli' having only a black spot on one side of the white centre instead of a complete border. In HUJ-R 1442 and 5108 (juveniles) there are only faint indications of 'ocelli'. The specimen from El-Hamma has 'normal' 'ocelli', each occupying a scale.

Eumeces schneideri princeps Eichwald

(Pl. 5 B)

Euprepes princeps Eichwald, 1839. Bull. Soc. Imp. Nat. Moscow, 2 : 303–307 ("In ora Caspia occidentali, ad montes praesertim Talyschensis").
Eumeces princeps, Taylor, 1935. Kansas Univ. Sci. Bull., 23 : 138.
Eumeces schneideri princeps, Eiselt, 1940. Zool. Anz., 131 : 218.

MATERIAL EXAMINED (1). BM 1965.695 ♂ Ain el Enoquiyya (basalt desert), April–May 1965, S. Bisserôt.

PHOLIDOSIS. Scales around middle of body: 27. Dorsal scales from occiput to above cloaca: 67.

MEASUREMENTS. SV: 115 mm (tail regenerated).

COLORATION. Ground colour of back light brown. No light spots. Along the

flank a dark brown band, 2–3 scales broad; its lower border half a scale above the light lateral band, its upper border fairly sharp (Pl. 5 B). The light lateral band is intensely white. (It may have been yellow at the time the animal was killed, six months prior to its examination by me.)

Remarks. The scale counts of this specimen are characteristic of *princeps* (Eiselt, 1940: Table 1), but the colour is unusual, and may represent an adaptation to the basalt desert. A specimen from Shaubak (BM 1963.669) here assigned to *schneideri* shows some tendency towards a similar coloration. However, a specimen collected 65 miles SSE of Amman (HUJ-R 1389) and clearly assignable to *princeps* (27 scale rows, 69 dorsal scales from occiput to above cloaca) is uniformly coloured having neither light spots nor darkened flanks, the light lateral band merging with the light belly.

Eumeces schneideri schneideri Daudin

(Pl. 5 A, C)

Scincus schneideri, Daudin, 1802. Hist. Nat. Rept., 4 : 291.
Eumeces schneideri (part*), Taylor, 1935. Kansas Univ. Sci. Bull. 23 : 126.
Eumeces schneideri schneideri, Eiselt, 1940. Zool. Anz., 131 : 213.

Material examined (2). BM 1963.669 N of Shaubak, 1963, S. Bisserôt. BM 1965.786 Petra (on red sandstone), 1965, D. Western.

Pholidosis. Scales around middle of body: 26, 24. Dorsal scales from occiput to above cloaca: 65, 66.

Measurements. Largest (BM 1965.786): SV: 114 mm; tail: 209 mm.

Coloration. Both specimens have the usual light lateral band passing through the ear. BM 1963.669 (Pl. 5 C): Only a few small light (originally yellow-orange ?) spots, each covering up to a third of a scale. Flanks mottled dark brown above the light band; each dark spot covering the posterior portion of a scale. BM 1965.786 (Pl. 5 A): collector's note: "green with orange spots". The spots each cover up to a whole scale, and are irregularly arranged; a tendency to form transverse series is particularly evident on the tail.

Remarks. These specimens were collected relatively near the area where, in Israel, the northwestern *pavimentatus*, and the southern *schneideri* intergrade. In southern Israel and in Sinai (Schmidt and Marx, 1956 : 28) there occur populations in which the pattern is regularly of the *schneideri* type, but the scale counts of many specimens tend towards those characterizing *pavimentatus* (Eiselt, 1940: Table 1). This situation is exemplified by BM 1965.786 from Petra, which it seems best to assign to *schneideri* (see also Taylor, 1935 : 130) like the specimens from southern-

*Taylor includes in *schneideri* single specimens from "Haiffa" and "Mt. Jerusalem", within the range of *pavimentatus*. These specimens evidently are adult males of *pavimentatus* which, unlike the females, lose the whitish streaks adorning the young. The orange spots however, remain arranged in longitudinal rows (see his Plate 5).

most Israel. BM 1963.669 from North of Shaubak has 26 scale rows, and its very broad dorsal scales exclude it from *princeps*.

Mabuya vittata Olivier

Scincus vittatus Olivier, 1804. Voy. Emp. Ottoman, 3, p. 103, pl. 29, fig. 1 (sands west of Rosetta).
Mabuia vittata Boulenger, 1887. Cat. Lizards Brit. Mus., 3, p. 176.

Material examined (1). BM 1963.670 2 km SE Druze village, Azraq, 1963, S. Bisserôt.

Pholidosis. Scales around middle of body: 32.

Measurements. SV: 73 mm; tail: 80 mm.

Coloration. Dorsum brown, with three light longitudinal bands. No darker spots, except tiny ones on occiput.

Remarks. Of 4 specimens from the surroundings of Jerash (HUJ-R 1423, 1424, 1426, 1547; November 1945, Coll. Haas and Hoofien), 3 have 32 scales around the middle of the body, and one has 34. The largest of these measures 95 mm (SV). The pattern varies: one specimen resembles BM 1963.670, but another has 5 light bands, and two have 4, the median one being obliterated. The other 3 specimens have most dorsal scales partly edged in black (or dark brown), particularly towards the borders of the light bands. In Cisjordan, too, the pattern and colour of this species are highly variable (*cf.* Peracca, 1894 : 8).

OPHIDIA

COLUBRIDAE

Natrix tessellata tessellata Laurenti

Coronella tessellata Laurenti, 1768. Synops. Rept.: 87 ("in Japidia, vulgo Cars").
Natrix tessellata, Bonaparte, 1834. Iconogr. Faun. Ital., 2, 11 : plate.
Natrix tessellata tessellata, (Hecht) 1930. Mitt. zool. Mus. Berlin, 16 : 319.

Material examined (1). BM 1965.696 juv., Shishan (sandy area nr. date palms), 1965, S. Bisserôt.

Pholidosis. Scale rows: 19. Ventrals: 165. Subcaudals: 62.

Measurements. SV: 190 mm; tail: 45 mm.

Remarks. Three juveniles from Birketen near Jerash (HUJ-R 3024, 3063, 3071; November 1945, Coll. Haas and Hoofien) have 164–166 ventrals and 65–67 subcaudals. In Cisjordan (N = 9), similarly, 160–169 ventrals and 56–66 subcaudals have been counted.

Coluber rhodorhachis rhodorhachis Jan

(Pl. 6 A, B)

Zamenis rhodorhachis Jan, 1865. In De Filippi, Viagg. in Persia, p. 356 (Iran; restricted by Kramer and Schnurrenberger, 1963, p. 501, to Schiras, Central Persia.)
Coluber rhodorhachis, Parker, 1931. Ann. Mag. Nat. Hist., (10), 8 : 516.
Coluber rhodorhachis rhodorhachis, Khalaf, 1959. Reptiles of Iraq with some notes on the Amphibians, Baghdad, pp. 75–76.

MATERIAL EXAMINED (1). BM 1965.805 ♀ Petra, 1965, D. Western.

PHOLIDOSIS. Scale rows: 19. Ventrals: 242. Subcaudals: 133.

MEASUREMENTS. SV: 790 mm; tail: 320 mm.

COLORATION. Dark crossbands on anterior part of back (65–70) somewhat irregular, nearly four times as broad as the light intervening spaces. First dark crossband (on the occiput) interrupted mid-dorsally by a faint light vertebral line (Pl. 6 A).

REMARKS. This is apparently the first formal record of *C. rhodorhachis* from Transjordan proper. The range extension involved is only minor, as the species is well known in the Wadi 'Arava (Haas, 1951).

Although this specimen was collected at Petra, and its pholidosis agrees with material from the adjacent territory of Cisjordan, its coloration deviates markedly from that found in these specimens. In Cisjordan the dark crossbands are usually distinctly narrower than the intervening light spaces (Pl. 6 B), or at the most as broad as the latter. The same appears to be true of Egyptian specimens (Anderson, 1898: pl. 35). On the other hand, I have seen broad and close dark crossbands, like those of the Petra specimen, in an example from Iran (MCZ 58872), though in this case only the anterior 30–35 crossbands are so broad, the more posterior ones gradually become narrower. The similarity of these two specimens does not, however, mean very much, as the species exhibits high variability of colour and pattern.

Terent'ev and Chernov (1949 : 242) accept *C. r. ladacensis* Anderson 1871 (Boulenger, 1890 : 326) as a distinct form. Mertens (1956 : 95) and Kramer and Schnurrenberger (1963 : 501) doubt its validity. In fact, Anderson himself (1895 : 654, footnote 1) says "I am indebted to the Trustees of the Indian Museum for the opportunity of re-examining the types of *Z. ladacensis*. They are unquestionably identical with Jan's *Z. rhodorhachis*. At the time I described the species, Jan's work was not in the library of the Indian Museum, Calcutta". Thus, so far all *Coluber rhodorhachis* specimens, apart from the Somalian *C. r. subnigra* Boettger 1893 (Parker, 1949 : 30–37), are assignable to the typical form.

Coluber rogersi Anderson

(Pl. 6 C, D)

Zamenis rogersi Anderson, 1893. Ann. Mag. Nat. Hist. (6)12 : 439 (Desert to the east of Helwan, near Cairo).
Coluber rogersi, Flower, 1933. Proc. Zool. Soc. London, p. 810–811.

MATERIAL EXAMINED (2). BM 1965.698 ♂ Five km S of Aseikhim, April–May 1965, S. Bisserôt. BM 1965.806 juv. ♂ (?) Azraq, 1965, D. Western.

PHOLIDOSIS. Scale rows: 19; 19. Ventrals: 195; 204. Anals divided. Tails incomplete.

MEASUREMENTS. SV: 565; 220 mm. (Tails incomplete.)

COLORATION. In both specimens, the anterior three-quarters of body has about 55 dark, closely set, dorsal blotches (Pl. 6 C). Posteriorly the blotches gradually become indistinct. The first three blotches are confluent mid-dorsally to form a longitudinal streak behind the occiput. Tail uniformly grey.

REMARKS. The pattern resembles that normally encountered in (southern) Cisjordan (Pl. 6 D), the blotches being closer to each other than those figured by Anderson (1898: pl. 36) for a male from "Beltim" (Nile delta). The scale count appears to be higher in Transjordan than in Cisjordan: Two specimens from 65 km SSE of Amman have 200 ventrals each (HUJ-R 3183/1 and 2); one from N of Zerka has 195. Thus while in Cisjordan we find 188–200 ventrals (N = 13), we find 195–204 (N = 5) in Transjordan. A single specimen from Iraq has 206 (HUJ-R 3540).

Malpolon moilensis Reuss

Coluber moilensis Reuss, 1834. Mus. Senckenb. 1, p. 142 (near Moila, on the Red Sea coast of Arabia).
Malpolon moilensis, Parker, 1931. Ann. Mag. Nat. Hist. (10) 8 : 522.

MATERIAL EXAMINED (1). BM 1965.697 ♂ (?). Three miles N of Druze (Track through hamada), April–May 1965, S. Bisserôt.

PHOLIDOSIS. Scale rows: 17. Ventrals: 166. Anal divided. Subcaudals: 50.

MEASUREMENTS. SV: 443 mm; tail: 95 mm.

COLORATION (After preservation). Brown with darker brown spots, of varying distinctness, which are arranged in eight longitudinal rows. Neighbouring spots tend to merge, forming obliquely transverse streaks. A conspicuous dark brown blotch is present on each temporal region.

REMARKS. This appears to be the first record of this snake from Transjordan. The species has recently been recorded from southern Cisjordan, where it is rare (Barash & Hoofien, 1956). Most, if not all, specimens were actually found in the Wadi 'Arava, so that the inclusion of this species in the fauna of Transjordan would have been a matter of course. The locality recorded here, however, constitutes a significant range extension.

Malpolon monspessulanus insignitus Geoffroy

Coluber insignitus Geoffroy in Savignyi, 1827. Descr. Egypte., Hist. nat., 1 Rept.: 151; pl. 7, Fig. 6 (Lower Egypt).
Malpolon monspessulanus insignitus, Mertens and Müller, 1928, Abh. senckenberg. naturf. Ges., Frankfurt a.M., 41 : 51.

MATERIAL EXAMINED (1). BM 1965.807 ♂ Azraq, 1965, D. Western.

PHOLIDOSIS. Scale rows: 19. Ventrals: 173. Anal divided. Subcaudals: 83.

MEASUREMENTS. SV: 745 mm. Tail: 210 mm.

COLORATION (After preservation). Nearly uniform dark grey. Belly whitish with some light grey mottling.

DISCUSSION

The material reported here does not on its own permit an analysis of the herpetofauna of Transjordan in terms of ecology or zoogeography. However, the specimens have been assembled on several trips, so that at least the lizard material probably reflects to some extent the abundance of the species in certain habitats and localities. It thus seems profitable to relate the data available to existing general information on the ecological and biogeographical subdivision of Transjordan and to the known circumstances in Cisjordan.

General Biogeography of Transjordan

The variegated zoogeography of Transjordan was outlined by Bodenheimer (1935 : 24). His basically correct map (1935: Fig. 6) was superseded by the more recent work of botanists (Bodenheimer, 1953 : 85). Feinbrun and Zohary prepared a phytogeographical map (1955 : 15) dividing Transjordan into the same three territories, Mediterranean, Irano-Turanian, and Saharo-Sindian, into which Cisjordan is also divided (Zohary, 1955). This division, based on the mapping of plant associations (Feinbrun and Zohary, 1955: folding map), is related to the distribution of soil types and, more closely, to that of rainfall (maps, Feinbrun and Zohary, 1955 : 9 and 13; Poore and Robertson, 1964 : 12; Bender, 1968 : 10 and 180). The phytogeographical map of Feinbrun and Zohary (1955 : 15) furnished the basis for the delimitation of biogeographical territories in Text-fig. 8. (A fourth territory, the 'Sudanian Penetration Territory', has been proposed for the Lower Jordan Valley and the Wadi 'Arava by Gruenberg-Fertig, 1965). The general ranges of the three biogeographical territories in southwestern Asia are presented by a map recently published elsewhere (Haas and Werner, 1969 : 368).

Poore and Robertson (1964 : 14–15) similarly classified the Transjordanian range types into three basic regions: Mediterranean, Steppe, and Desert of varying type (limestone, basalt, sandstone and granite deserts). The salient differences between the two maps are few: The Mediterranean region of Poore and Robertson is narrower (in W–E direction) than that of Feinbrun and Zohary (shown here in Text-fig. 8) so that for instance, Petra, Tafila and Shaubak are excluded from it (the first lying just west of, the two last, just east of, Poore and Robertson's Mediterranean region). The Steppe region of Poore and Robertson, roughly coinciding in the south with Feinbrun and Zohary's Irano-Turanian territory, reaches in the north eastwards to only halfway between Amman and Azraq. (Guest (1966: Figs 13, 14) apparently includes the area around, and east of, Azraq, in the Irano–Turanian, in agreement

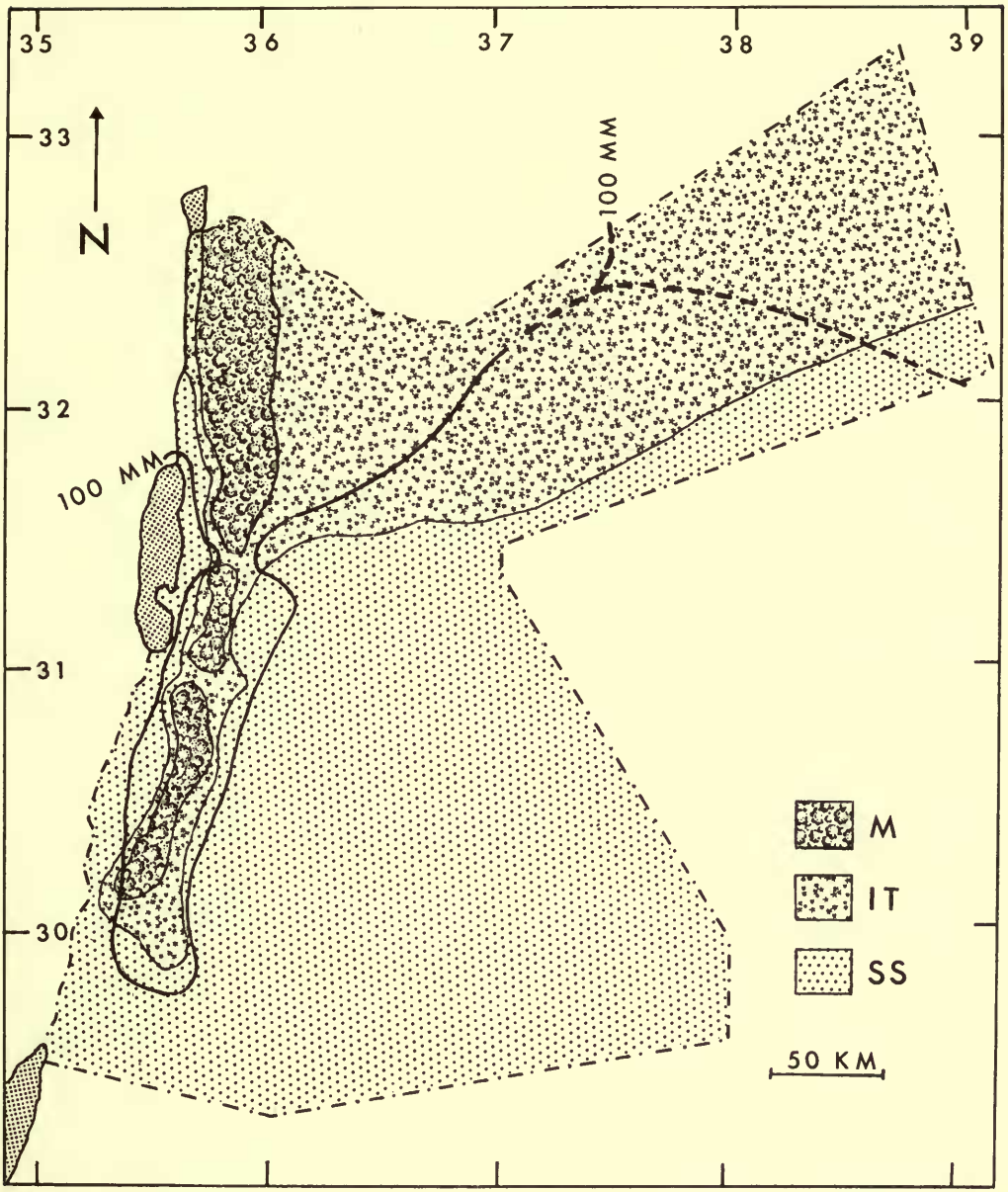


FIG. 8. The biogeography of Transjordan, based on Feinbrun and Zohary (1955). The 100 mm mean annual precipitation line is based on Poore and Robertson (1963); its interrupted part (extrapolated alternatives in area lacking data) is based on various sources. M, Mediterranean; IT, Irano-Turanian; SS, Saharo-Sindian.

with Feinbrun and Zohary.) At the latitude of the Dead Sea Poore and Robertson's Steppe region has a south-eastern extension (as compared to Feinbrun and Zohary's Irano–Turanian territory) so as to include El Qatrane. The desert regions of Poore and Robertson include areas excluded from Feinbrun and Zohary's Saharo–Sindian territory. Firstly, the district around, and east of, Azraq; secondly, a broader zone in the Jordan Valley and especially in its northern part. Thus, Salt (NW of Amman) and Petra are well within the Mediterranean territory of Feinbrun and Zohary, but on the fringe of the desert according to Poore and Robertson.

The bioclimates of Transjordan have been defined and mapped by Long (1957; also in Poore and Robertson, 1964 : 10, and 13). His map corresponds closely to the two biogeographical maps just discussed; concerning the district surrounding, and east of, Azraq, it is intermediate between them. The climates of the Mediterranean territory are "sub-humid and semi-arid mediterranean bioclimates"; those of the Irano–Turanian (~ Steppe) territory are "arid mediterranean bioclimates"; and the Saharo–Sindian (~ desert) territory has "saharan mediterranean bioclimates". Among the latter, the "cool variety" characterizes the Azraq district. Long's map differs from the phytogeographical maps chiefly in that his "semi-arid mediterranean bioclimate" (~ Mediterranean territory) reaches southwards only to a point between Shaubak and Petra. However, this difference may conceivably result from the paucity of meteorological information available to Long (Poore and Robertson, 1964 : 11).

Thus Transjordan comprises three gross ecological, hence biogeographical territories. Relying on the sources cited, these may be briefly characterized as follows:

The Mediterranean territory includes the hills of Gilead and the western parts of Ammon, Moab and N Edom. In the south this narrow territory is confined to the higher hills, and interrupted between them. Predominant soils are terra-rossa, white Cenomanian soil and grey Senonian soil; along the Jordan Valley, areas of Nubian sandstone are included. The bioclimate conforms in the main to the semi-arid mediterranean type. Annual rainfall varies from about 700 mm on northern mountaintops down to ca. 300, and even below 200, south of Petra. Vegetation is characterized by a climax of Mediterranean Maquis and forest types, and by areas covered with various shrubs, including many Labiatae.

The Irano–Turanian territory surrounds the Mediterranean territory except in the north (where the latter continues into Syria and Lebanon). Above latitude 31° 30′ N the otherwise narrow zone widens eastwards, extending to at least halfway between Amman and Azraq, possibly to the frontier. The commonest soils are loess and grey calcareous steppe soils (Basalt from Azraq to Burqu). The bioclimate is of the arid mediterranean types (of the saharan mediterranean type, cool variety, around Azraq); annual rainfall is between ca. 350 mm and ca. 100 mm. Vegetation is typically a steppe of dwarf-shrubs (*Artemisia herba-alba* is prominent) or of herbs (*e.g. Poa sinica* and *Carex pachystylis*), and includes remnants of a *Pistacia atlantica* forest.

The Saharo–Sindian territory occupies the vast southern and eastern desert of Transjordan, as well as the lower parts of the Rift Valley. The greatest part, north of latitude 29° 40′ N, is characterized by lime-stone hamadas, the ground generally

being covered by a layer of flints. Further south, and in the Rift Valley, Nubian sandstone and sand predominate, with an area of granite (rock and sand) in the Wadi 'Arava. A vast basalt desert, from Azraq to Burqu, is largely covered by basalt boulders of varying size. The bioclimates are of the Saharan Mediterranean types. Rainfall is normally below 150 mm, in the extreme southeast below 50 mm. Vegetation is scanty except in the wadis. Associations of *Anabasis articulata* are prominent, and on granite sands—*Haloxylon* spp.

Distribution of Reptiles

This discussion is limited to the 23 species and subspecies reported here. Among these, 16 occur also in Cisjordan. Two ubiquitous species were collected in all three regions of Transjordan (and similarly occur in all parts of Cisjordan): *Hemidactylus turcicus* and *Chalcides o. ocellatus*. These have an essentially circum-mediterranean distribution, which is particularly broad to the south and east. *Agama stellio* is similarly circum-eastern-mediterranean, but unfortunately its infraspecific taxonomy is not clear.

Four forms occur in Cisjordan as Mediterranean elements: *Chamaeleo chamaeleon recticrista, Mabuya vittata, Natrix t. tessellata* and *Malpolon m. insignitus*. The first three are here reported from the Mediterranean territory of Transjordan; *Mabuya vittata* and *Natrix t. tessellata* were also found at Azraq or at the neighbouring Shishan (within the disputed area belonging to either the Irano–Turanian or Saharo–Sindian territory). *Malpolon m. insignitus* is reported from Azraq. This distribution is probably due to the local conditions prevailing at these places. *N. t. tessellata* is semiaquatic; *M. vittata* is facultatively hydrophilic, and lives, *e.g.*, also among reeds surrounding the salt marshes south of the Dead Sea (pers. obs.).

Seven reptiles typical of Cisjordanian desert habitats were collected in the Irano–Turanian and Saharo–Sindian areas of Transjordan: *Agama sinaita, Acanthodactylus b. asper, Eremias g. gutulata, Eumeces s. schneideri, Coluber rhodorhachis, C. rogersi,* and *Malpolon moilensis*. We shall consider first the two *Coluber* species. All of 4 localities for *Coluber rogersi* fall within the Irano–Turanian (according to Feinbrun and Zohary; but 2 within the desert according to Poore and Robertson.). In Cisjordan this snake occupies both the Irano–Turanian and Saharo–Sindian territories, with the exception of the (hot) Wadi 'Arava. Its world distribution is Saharo–Sindian and to some extent, Irano–Turanian. *C. rhodorhachis* occurs in Cisjordan mainly in the Saharo–Sindian territory (Wadi 'Arava and southern Negev), and the first and only record for Transjordan is from Petra, on the fringe of the Wadi 'Arava. Its world distribution is Irano–Turanian and Saharo–Sindian. The two lacertids, *A. b. asper* and *E. g. guttulata*, are reported from both Irano–Turanian and Saharo–Sindian localities in Transjordan. Similarly, they are known in Cisjordan from suitable habitats throughout the Negev. Their world distribution is Saharo–Sindian. The remaining forms, *Agama sinaita, Eumeces s. schneideri* and *Malpolon moilensis*, were taken in Transjordan at more or less desertic localities (at least according to Poore and Robertson). In Cisjordan these are restricted to the Saharo–Sindian part of the Negev, and their world distribution is Saharo–Sindian.

The ranges of the two forms of *Ptyodactylus* apparently fail to coincide with any of the ecological territories described above. *P. h. puiseuxi*, a morphologically well defined form, is common in northernmost Cisjordan and in Transjordan, on the hills bordering Lake Tiberias on the east, and around Jerash—all in the mediterranean territory—but is here reported also from the fringe of the basalt desert ca. 10km E of Azraq (Wadi Aseikhim). It may eventually turn out to be basically a form inhabiting basalt rocks, which has spread to adjacent habitats. *P. h. guttatus* is less well defined and in particular not clearly distinguishable from *P. h. hasselquistii*. Geckos currently assigned to *guttatus* are common in the Mediterranean, Irano–Turanian and Saharo–Sindian territories of Cisjordan—in effect throughout the country excepting its northern and southern extremes. So far, our records for Transjordan are all within the (southwestern) Saharo–Sindian (Rum; S of Guweira) or on its rim (Petra; Wadi Musa). Evidently the ranges of these two geckos are influenced to a great extent by factors other than the climate, perhaps because they can modify their exposure to it by varying the relative duration of nocturnal and diurnal activity.

Of the Transjordanian reptiles reported here, seven forms do not occur in Cisjordan. Of these, six are apparently Irano–Turanian elements, as far as their general ranges are concerned: *Agama p. haasi*, *Acanthodactylus grandis*, *A. t. tristrami*, *Eremias b. microlepis*, *Ophisops e. blanfordi*, and *Eumeces s. princeps*. In Transjordan, *A. p. haasi* has been collected mostly within the Irano–Turanian, but also within the Saharo–Sindian. In Cisjordan, *A. p. pallida* similarly occurs in both territories. *A. grandis* has been collected in the Irano–Turanian and Saharo–Sindian, and *A. t. tristrami* in the Irano–Turanian and Mediterranean. Some of the localities for *E. b. microlepis* are within the Irano–Turanian, the rest within the Saharo–Sindian. These three lacertids have no conspecific relations in Cisjordan. *O. e. blanfordi* has been collected within the Irano–Turanian and on both its mesic and desertic borders. The related *O. e. ehrenbergi* occurs in the Mediterranean and Irano–Turanian of Cisjordan, and also in the Mediterranean of Transjordan (around Jerash).

The case of *E. s. princeps* is of particular interest since three distinct, apparently allopatric, races of *E. schneideri* occur in Transjordan and adjacent areas (Mertens, 1920, 1924, 1946; Taylor, 1935; Eiselt, 1940). Both localities reported here for *E. s. princeps* are within the Irano–Turanian, and this agrees with this race's general distribution. In the Saharo–Sindian of both Cis- and Transjordan *E. s. schneideri* occurs, while *E. s. pavimentatus* lives in the Mediterranean of Cisjordan. Its occurrence in Transjordan, which is probable, remains to be shown.

The last of the Transjordanian reptiles not occurring in Cisjordan is *Agama blanfordi fieldi* (*A. persica fieldi* Haas and Werner, 1969). This obviously is a Saharo–Sindian, Arabian, form. Its taxonomic relationship with the superficially similar psammophile, *A. savignii* of eastern Egypt, Sinai and southern Cisjordan, has not been studied but the two probably occupy comparable ecological niches.

In conclusion, the locality data presented here for Transjordanian lizards and snakes are in good agreement with a generalized subdivision of Transjordan into three major ecological-biogeographical territories, based on both the maps of Feinbrun and Zohary (1955 : 15) and Poore and Robertson (1964 : 14–15). The species

of the Mediterranean territory exhibit no marked morphological deviations from their conspecific counterparts in the Mediterranean of Cisjordan. On the other hand, in several species of desert reptiles (Saharo–Sindian or Saharo–Sindian and Irano–Turanian), the Transjordan population appears to differ from the Cisjordanian one. Furthermore, one Saharo–Sindian species, *Agama blanfordi*, does not occur west of the Rift Valley. Conspicuous is the occurrence in Transjordan of six Irano–Turanian species, of which three do not occur in Cisjordan, while the remaining three are represented there by other (well defined) subspecies (see also Haas, 1952). The reciprocal phenomenon also exists as not all Cisjordanian reptiles occur in Transjordan. Thus among the Saharan psammophile reptiles of southern Cisjordan, five occur only west of the Rift Valley. Another species, *Sphenops sepsoides*, penetrates into the Rift Valley (Werner, 1968), and only one other, *Acanthodactylus scutellatus scutellatus*, is represented east of the Rift Valley by another subspecies, *A. s. hardyi* (northwestern Saudi Arabia—Haas, 1957; Iraq—Haas and Werner, 1969). It is tempting to assume that the Wadi 'Arava, together with the very steep mountain slopes bordering it on the east, constitutes a barrier to the distribution of reptiles, though more direct evidence on this effect would be desirable.

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APPENDIX

List of lizards and snakes so far recorded from Transjordan (incl. Wadi 'Arava)

The documentation cited in parentheses, for species not represented in this report, is not necessarily the earliest one available. The names listed are not necessarily those employed for the same taxa by the authors cited.

LACERTILIA

GEKKONIDAE

1. *Bunopus blanfordii* Strauch (Barash and Hoofien, 1956)
2. *Ceramodactylus doriae* Blanford (Haas, 1956)
3. *Hemidactylus turcicus turcicus* L.
4. *Pristurus flavipunctatus guweirensis* Haas (Haas, 1951)
5. *Ptyodactylus hasselquistii guttatus* von Heyden
6. *Ptyodactylus hasselquistii puiseuxi* Boutan
7. *Stenodactylus grandiceps* Haas (Haas, 1951)
8. *Stenodactylus sthenodactylus sthenodactylus* Lichtenstein (Haas, 1951)
9. *Tropiocolotes steudneri* Peters (Haas, 1951)

AGAMIDAE

10. *Agama blanfordi fieldi* Haas and Werner
11. *Agama pallida haasi* Werner
12. *Agama sinaita* von Heyden
13. *Agama stellio brachydactyla* Haas
14. *Agama stellio picea* Parker (Haas, 1951)
15. *Agama stellio stellio* L. (Daan, 1967)

CHAMAELEONIDAE

16. *Chamaeleo chamaeleon recticrista* Boettger

LACERTIDAE

17. *Acanthodactylus boskianus asper* Audouin
18. *Acanthodactylus cantoris schmidti* Haas (Hoofien, 1965)
19. *Acanthodactylus grandis* Boulenger
20. *Acanthodactylus robustus* Werner (Haas, 1951)
21. *Acanthodactylus tristrami tristrami* Günther
22. *Eremias brevirostris microlepis* Angel
23. *Eremias guttulata guttulata* Lichtenstein
24. *Eremias guttulata watsonana* Stoliczka? (Wettstein, 1951)
25. *Eremias olivieri schmidti* Haas, (Haas 1951)
26. *Lacerta danfordi danfordi* Günther (Hoofien, 1969)
27. *Ophisops elegans blanfordi* Schmidt
28. *Ophisops elegans ehrenbergi* Wiegmann (Haas, 1951)
29. *Ophisops elegans elegans* Ménétriés (Schmidt, 1939)

SCINCIDAE

30. *Ablepharus kitaibelii* Bibron et Bory (Haas, 1951)
31. *Chalcides ocellatus ocellatus* Forskål
32. *Eumeces schneideri princeps* Eichwald

33. *Eumeces schneideri schneideri* Daudin
34. *Mabuya vittata* Olivier
35. *Ophiomorus latastii* Boulenger (Anderson & Leviton, 1966)
36. *Scincus* sp. (Haas, 1951)
37. *Sphenops sepsoides* Audouin (Werner, 1968)

ANGUIDAE

38. *Ophisaurus apodus* Pallas (Haas, 1951)

VARANIDAE

39. *Varanus griseus griseus* Daudin (Haas, 1951)

OPHIDIA

LEPTOTYPHLOPIDAE

40. *Leptotyphlops phillipsi* Barbour (Haas, 1951)

COLUBRIDAE

41. *Coluber jugularis jugularis* L. (Haas, 1951)
42. *Coluber najadum* Eichwald (Haas, 1951)
43. *Coluber ravergieri nummifer* Reuss (Flower, 1933)
44. *Coluber rhodorhachis* Jan
45. *Coluber rogersi* Anderson
46. *Eirenis collaris* Ménétriés (Haas, 1951)
47. *Eirenis coronella coronella* Schlegel (Schmidt, 1939)
48. *Eirenis coronella fraseri* Schmidt (Haas, 1951)
49. *Eirenis decemlineata* Dumeril & Bibron (Haas, 1951)
50. *Eirenis rothi* Jan (Haas, 1951)
51. *Malpolon moilensis* Reuss
52. *Malpolon monspessulanus insignitus* Geoffroy
53. *Natrix tessellata tessellata* Laurenti
54. *Psammophis schokari* Forskål (Haas, 1951)
55. *Rhynchocalamus melanocephalus* Jan (Hart, 1891)
56. *Spalerosophis diadema* ssp. (Haas, 1951)
57. *Tarbophis nigriceps* Ahl (Haas, 1951)

VIPERIDAE

58. *Cerastes cerastes* L. (Haas, 1951)
59. *Echis colorata* Günther (Haas, 1951)
60. *Pseudocerastes fieldi* Schmidt (Haas, 1951)

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PLATE 1

Agama pallida subspp.:

(A–D) *A. p. haasi* subsp. nov.: (A) Holotype ♂, BM 1965.800, dorsal view; (B) Same, left ear; (C) Juvenile, BM 1965.797, right ear; (D) Paratype ♀, HUJ-R 1884.

(E–F) *A. p. pallida* Reuss : (E) From southern Cisjordan (Wadi Ajram) ♂, HUJ-R 1623; (F) From eastern Egypt (Kassassin) ♂, HUJ-R 1126.

Scale, cm and mm (D–F at same magnification).


0 1 2 3
10 9 8 7
A
B
C
D
5
E
F

PLATE 2

Agama pallida pallida Reuss holotype ♀, SMF 10007:

(A) Dorsal view; (B) Head.


A

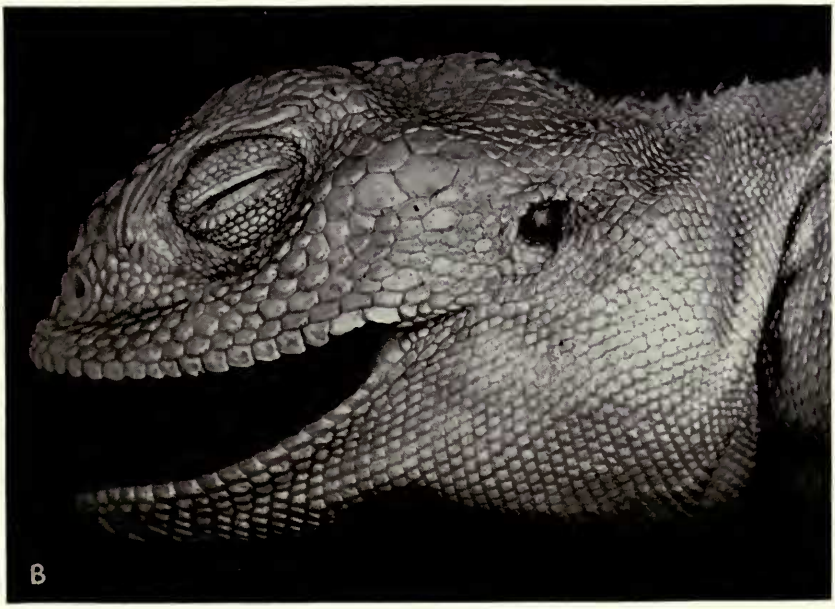
B

PLATE 3

(A) *Agama blanfordi fieldi* ♂, BM 1965.686.

(B–E) *Agama sinaita:* (B) Dorsal view of left pes, and (C) of base of tail, of ♂ from northern Transjordan (Wadi Ratam), BM 1965.685; (D) Dorsal view of left pes of ♀ from southern Cisjordan, HUJ-R 1919; (E) Dorsal view of tail base of ♂ from southern Cisjordan, HUJ-R 1794. Scale, cm and mm (B–E at same magnification).

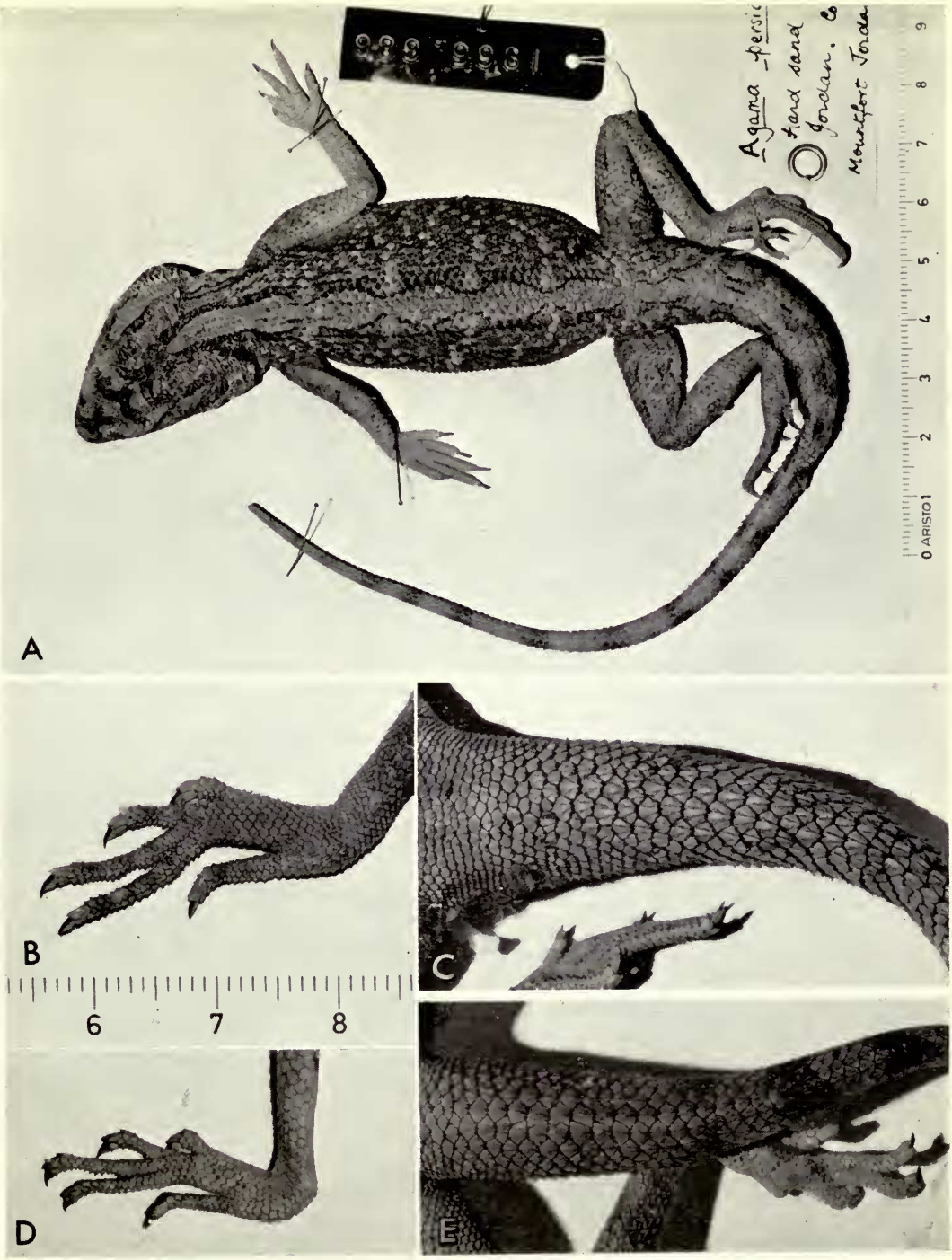
A
B
C
D
E
6
7
8

PLATE 4

(A–B) *Acanthodactylus grandis:* (A) Adult ♀ from Tell el Mukheizin, BM 1965.694; (B) Young ♀ from Ain el Enoquiyya, BM 1965.692.

(C–D) *Acanthodactylus tristrami tristrami:* (C) ♀ from the Jordanian-Syrian border, BM 1962.352; (D) ♂ from 15 Km S of Amman, HUJ-R 1333.

Scale, cm and mm (all at same magnification).

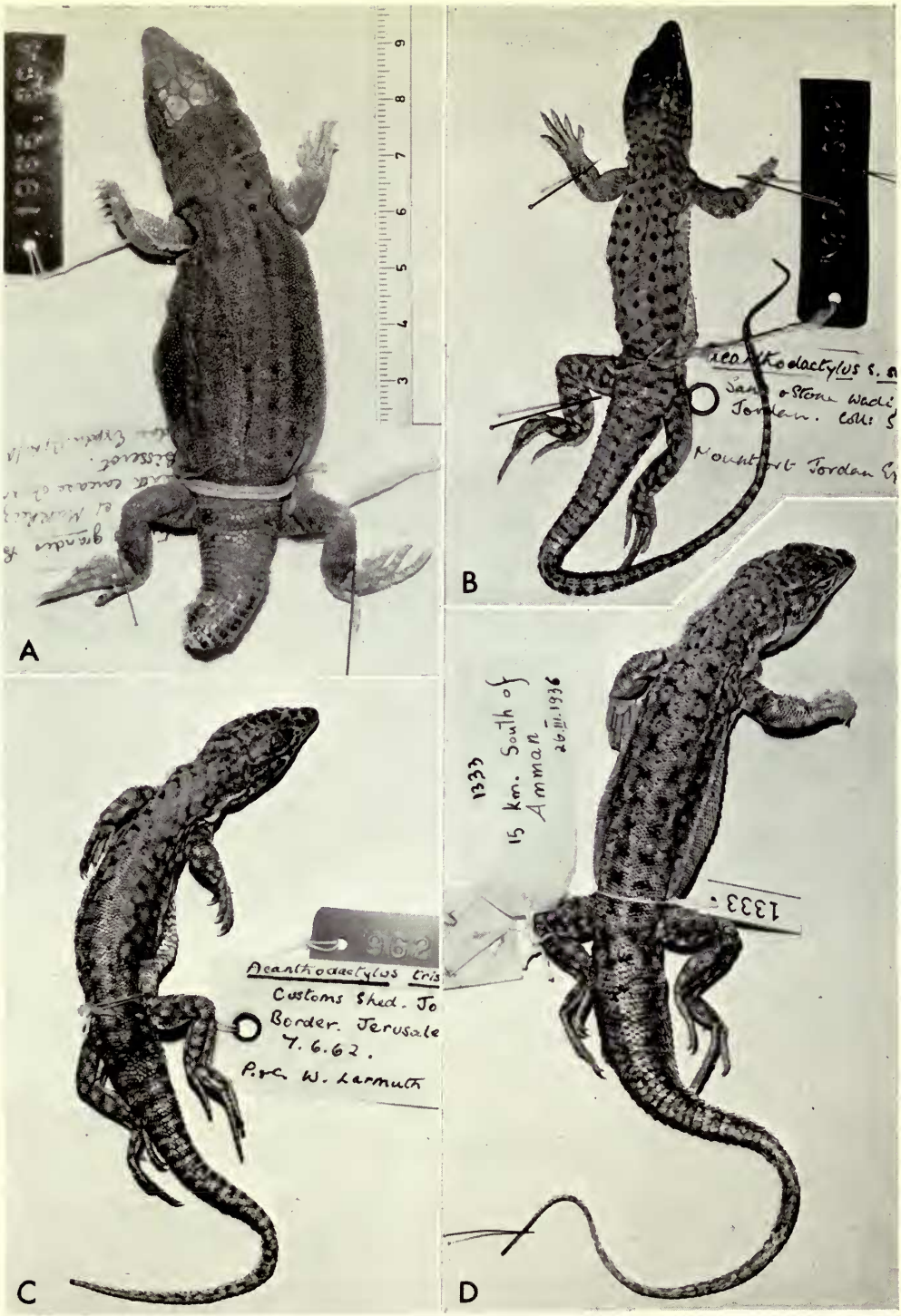
A
B
C
D
962
Acanthodactylus tris
Customs Shed. Jo
Border. Jerusale
7.6.62.
Pres. W. Larmuth
1333
15 km. South of
Amman
26.III.1936
1333.

PLATE 5

Eumeces schneideri subspp.:

(A) *E. s. schneideri* from Petra, BM 1965.786; (B) *E. s. princeps* from Ain el Enoquiyya, BM 1965.695; (C) *E. s. schneideri* from N Shaubak, BM 1963.669.
Scale, cm and mm.

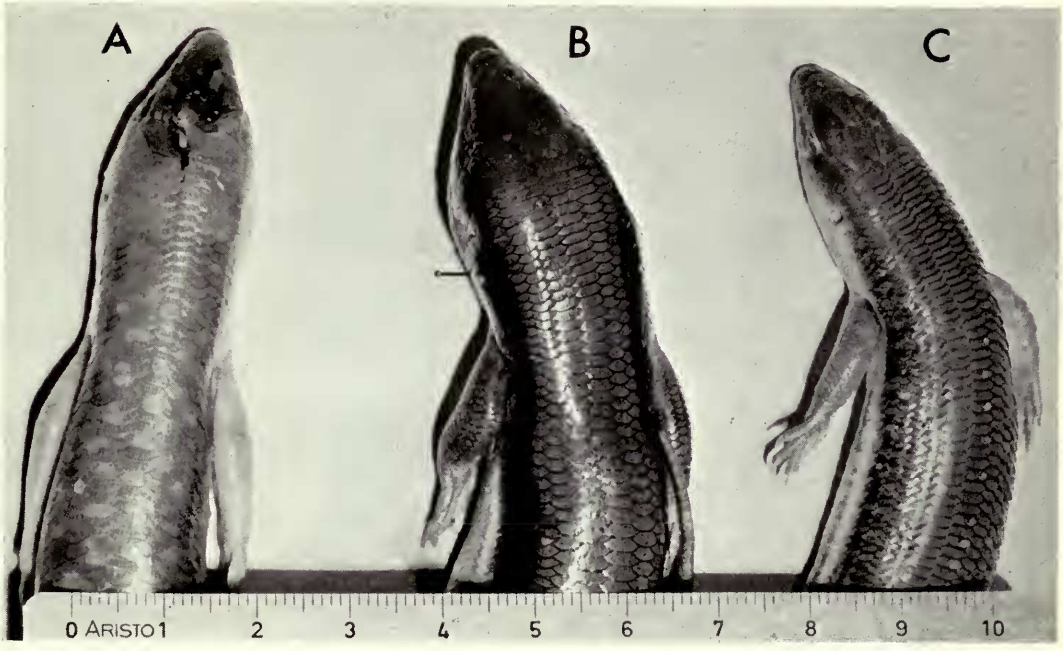
A
B
C
0 ARISTO 1 2 3 4 5 6 7 8 9 10

PLATE 6

(A–B) *Coluber rhodorhachis rhodorhachis*: (A) ♀ from Petra, BM 1965.805; (B) ♂ from southern Cisjordan, HUJ-R 3211.

(C–D) *Coluber rogersi:* (C) ♂ from 5 km S of Aseikhim, BM 1965.698; (D) ♀ from southern Cisjordan, HUJ-R 8020.

Scale, cm and mm.